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THE ORIGIN AND DEVELOPMENT OF THE OHIO STATE UNIVERSITY WITH SPECIAL REFERENCE TO THE BIOLOGICAL SCIENCES[1]

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I. BEGINNINGS

The Morrill Act establishing the Land Grant Colleges was signed by Abraham Lincoln, July 2, 1862. The gift of public lands was accepted by the Ohio Legislature in 1864, and at the same time, the responsibility of establishing and maintaining an Agricultural and Mechanical College. Provision was made concurrently for the first Board of Trustees—twenty-one in number. They first met in the office of Governor Rutherford B. Hayes, where they discussed and pondered upon what the college should be. At a later meeting, Mr. Joseph Sullivant reiterated that he was in favor of a broad and liberal foundation, and that if the Board had the means he would teach all that was worth knowing. The difference of opinion held then gradually wore away and, to a great degree, the concept of Mr. Sullivant and others like him has prevailed throughout the school.

The college was located in Franklin County in 1870, and on the William Neil farm north of Columbus in 1871. 331.11 acres were purchased. The course of study was decided upon, January 5, 1871, and it was the same that Mr. Sullivant had proposed at an earlier session. The same day the Trustees accepted Mr. Sullivant's drawing for the Seal of the College. The contract for the building was let the following July. University Hall, as it was later called, was built just north of a spring of clear, cool water.

A faculty of seven members was elected in January and April, 1873. They were present when school opened on September 17th, and seventeen students came. Others arrived the next day, and by the end of the school year about fifty students had been accepted. Some of the young people, being considered unqualified to enter, were turned away.

THE FIRST FACULTY OF THE OHIO AGRICULTURAL AND MECHANICAL COLLEGE 1873

Mr. Edward Orton, President, and Professor of Geology, Mining, and Metallurgy.
Mr. Thomas C. Mendenhall, Professor of Physics and Mechanics.
Dr. Sidney A. Norton, Professor of General and Applied Chemistry.
Mr. Joseph Milliken, Professor of English and Modern Language and Literature.
Dr. Norton S. Townshend, Professor of Agriculture and Botany.
Mr. John H. Wright, Assistant Professor of Ancient Languages and Literature.
Mr. Robert W. McFarland, Professor of Mathematics and Engineering.

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Subjects anticipated to be taught by Joseph Sullivant and later by the Board of Trustees were Zoology and Veterinary Science, which were introduced in 1874 and 1885 respectively, and Political Economy and Civil Polity, added in 1875. The Horticulture and Vegetable Physiology originally prescribed were apparently included in Botany at the time.

By 1878, the College had been reorganized with change in politics, three times, the changes affecting the Board of Trustees rather than the Faculty. The last time, however, the name of the institution was changed to The Ohio State University, and the Board was again reduced to seven members.

In the seventy-seven years which have apssed since 1873, a gradual expanding in all the areas of learning in the University has occurred. It may be seen in the subdivision of existing departments, which has happened time and again, and in the creation of others. The foundation of each new department has usually been laid in courses already being taught, the need for the new department finally becoming evident. The expansion in biology illustrates the growth process apparent throughout the University during the years.

II. THE EVOLUTION OF THE BIOLOGICAL DEPARTMENTS

Dr. Norton S. Townshend was Professor of Agriculture and Botany in the first faculty of 1873. The Department of Horticulture and Botany was formed in 1880, Professor A. P. Morgan, Chairman, and Professor William R. Lazenby, his successor in 1881. This department was resolved into two others in 1891, the Chair of Horticulture being retained by Professor Lazenby. The new Chair of Botany and Forestry was accepted by Professor William A. Kellerman the same year.

The forestry division was returned to the Department of Horticulture in 1894, where it remained until 1908. At that time it was set up as a separate department, the chairmanship being assumed by Professor Lazenby. The Department of Horticulture passed to the headship of Professor Wendell Paddock in 1909. Professor Lazenby died in 1916, and the next year the two departments were merged, Professor Paddock in charge.

The expanding Department of Horticulture and Forestry came under the chairmanship of Dr. J. H. Gourley in 1929 and after his death, of Dr. Freeman S. Howlett in 1947.

The Department of Botany passed to the chairmanship of Professor John H. Shaffner in 1908. It has continued to flourish under the subsequent headships of Dr. Edgar N. Transeau, 1917, and Dr. Bernard S. Meyer, 1946. The name of this department was changed in 1946 to the Department of Botany and Plant Pathology.

The Chair of Zoology and Comparative Anatomy was created in 1874 and accepted by Professor Albert H. Tuttle. He was succeeded by Professor David S. Kellicott in 1888. In 1891, this department was enlarged and divided, Professor Kellicott becoming Chairman of the Department of Zoology and Entomology and Dr. A. M. Bleile, Chairman of the Department of Anatomy and Physiology.

The Department of Zoology and Entomology has continued its growth under the headships of Drs. Herbert Osborn, 1898, Raymond C. Osburn, 1917, Laurence H. Snyder, 1942, and David F. Miller, 1947.

III. AGENCIES IN BIOLOGY AND RELATED SCIENCES ORIGINATING AT THE OHIO STATE UNIVERSITY

Through the action of faculty members, ever mindful of widening opportunity and service, numerous organizations have arisen at the University which have played their part in the development of the Biological Sciences at the University and in the State. They are:

1. *The Ohio Agricultural Experiment Station.* The Station was authorized by the Ohio Legislature, April 17, 1882. Professor William R. Lazenby of the University was its sponsor and first director. It was moved from the University to

near Wooster, Ohio, in 1891, with Mr. C. E. Thorne, Director. In recent years a growing co-operation between the University and the Station has been occurring both in administration and in research. Dean Leo L. Rummell of the College of Agriculture of the University is also the Director of the Station.

2. *The Biology Club.* The club began under the name of the Biological Club of The Ohio State University and the Ohio Agricultural Experiment Station. Its first minutes were recorded in 1891. It continues to hold meetings throughout the school year. The most notable achievement of this club was the founding of the state Academy. Dr. W. D. Gray is the current President.

3. *The Ohio Academy of Science.* The Academy was organized in 1891 and it was incorporated, March 12, 1892. Its publication of reports and research papers began the same year and continued through 1902 in the four volumes of *Annual Reports.* The ensuing Annual Reports together with some papers, continued through 1930 in the five volumes of the *Proceedings.* The name of the Academy was shortened from the Ohio State Academy of Science in 1909.

The first volume of the *Ohio Naturalist,* official organ of the Academy, was published in 1903, and it covered the period after 1900. This volume and the next four were published by the Biological Club. The Ohio Naturalist became the *Ohio Journal of Science* in 1915, the official organ of the "Ohio State Scientific Society" and the Ohio Academy of Science. By 1927 the society was forgotten, and the Academy and the Journal were entirely freed of reference to their origin. The Journal contains the Annual Reports of the Academy since 1930. It is now in its fiftieth volume of the complete series. This journal has become a most valued medium of communication and exchange throughout the world.

Dr. Edward S. Thomas is currently President of the Academy, and Dr. Glenn W. Blaydes continues as Editor of the *Journal* since 1941.

4. *Franz Theodore Stone Institute of Hydrobiology.* The history of the Lake Laboratory began with an idea of Professor David H. Kellicott in 1891. His hopes were realized in 1896 when a second story was completed on the State Fish Hatchery Building at Sandusky, Ohio. It was used by him and his students that summer. This laboratory has grown in size and service, has had four different sites, and today exists as the Franz Theodore Stone Laboratory on Gibraltar Island, Put-in-Bay, Ohio. Eighty-six known papers emanating from research carried on in this laboratory had been published by 1928 when the contributions began. The story of the growth of the laboratory, written by Dr. Thomas H. Langlois, its Director, may be found in the latest *Contribution,* No. 11. This Institute was authorized in 1950.

5. *The Ohio Biological Survey.* The idea of the Survey originated with members of the Ohio Academy of Science, and it was proposed through the agency of the Academy, to the Board of Trustees of the University. The Survey was authorized in 1912, and has issued forty-one Bulletins dealing with the biology of Ohio. Dr. Herbert Osborn has continued as Director since the origin of the Survey.

6. *The Plant Institute.* The institute was organized in 1921 at the suggestion of Dr. Edgar N. Transeau, to include all the plant science departments of the College of Agriculture of the University. Reports by faculty members and graduate students of the Departments of Botany and Plant Pathology, Horticulture and Forestry, Agronomy, Agricultural Biochemistry, and more recently of Agricultural Engineering, have been presented through the years. Today the meetings are held bi-weekly throughout the school year. Invitation speakers from other institutions are occasionally sponsored by the Institute and the Graduate School. Dr. Richard A. Popham is Chairman.

7. *The Columbus Entomological Society.* This society was founded in 1936 by Dr. Frank L. Campbell and other entomologists and graduate students in the Department of Zoology and Entomology. It was organized to promote scientific and social activity among all the entomologists of the Columbus area. Monthly meetings are held during the school year. Mr. Howard Hintz is President.

8. *The Institute of Nutrition and Food Technology.* This institute was established in 1946 to facilitate the instruction of students, to promote research, and to foster closer co-operation in this field of endeavor by the University and the Ohio Agricultural Experiment Station. Dr. Thomas S. Sutton is Director.

9. *The Institute of Genetics.* The Genetics Seminar began at the University under the guidance of Dr. Laurence H. Snyder about 1935. It was interdepartmental, and has held weekly meetings during the school years. This seminar group is the nucleus of the Institute of Genetics which was created by the University in June, 1950. The latter will co-ordinate teaching and research in genetics, and will sponsor the programs of research in genetics carried out by the University and the Ohio Agricultural Experiment Station. Dr. David C. Rife is Chairman.

IV. THE OHIO STATE UNIVERSITY
1949–1950

To contemplate today the open expanse of the Neil Farm as it became the home of the future Ohio State University on October 13, 1870, and to do so in the light of all that has transpired here which has made the University what it is today, is to perceive a wonder in accomplishment.

As in the sister Land Grant Colleges and Universities, the achievement has been brought to pass by the concerted efforts of devoted people, wise in the long run, some responsible for its development and others supporting it with funds and good will.

At the end of the Spring Quarter 1950 we find:

41 deans, junior deans and directors
1,289 members of the faculty who serve full time
410 members of the faculty who serve part-time
996 assistant instructors, assistants and graduate assistants

2,736 The Total Faculty

2,216 non-teaching Personnel
88 Departments of Instruction

21,691 men students registered
6,599 women students registered

28,290 The Student Body. Of these:
5,433 students registered in the Graduate School
5,801 Bachelor's Degrees granted during the year
794 Master's Degrees
229 Doctor of Philosophy Degrees
836,900 Books in the Library, June 9th, 1950
$339,274.39 Amount of the Development Fund, 1949
417 acres, the Campus
383 acres, the University Air Port
295 acres, the University Golf Course
1,009 acres, the University Farm

2,104 The Total Acreage of the University
$43,237,774.03 the value of the Physical Plant of the University

The value of the service of the University is incalculable, and to that its 80,942 Alumni would testify.

SOURCES

1. History of the Ohio State University, edited by Thomas C. Mendenhall. Volume I, 1920, and Volume II, 1926. The Ohio State University Press. Columbus.
2. Memory, current records and interviews.

WAYS OF IMPROVING THE MALE FROG TEST FOR PREGNANCY

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It is the purpose of this paper to present some observations on emission of spermatozoa by the leopard frog, *Rana pipiens*, which are pertinent to the procedures used in applying these animals to pregnancy diagnosis. These observations indicate methods of increasing the accuracy of the test by lowering the percentage of false negatives and by avoiding possible false positives.

The male leopard frog, *Rana pipiens*, was first reported as a test animal for pregnancy by Wiltberger and Miller (1948) and Robbins and Parker (1948). Pregnancy is indicated when mature living spermatozoa appear in the urine of the frog (designated as positive) following the subcutaneous injection of 4 cc. of first morning urine. Absence of spermatozoa (designated as negative) indicates no pregnancy. The validity of the male frog test for pregnancy has been verified by Bodine et al (1950), Maier (1949) and Brody (1949).

The results of further experiments in our laboratory indicate that factors such as the quantity of liquid injected, the salinity of the liquid, the season of the year, the temperature of the room in which they sit during the test and conditions of storage and handling are influential in their sensitivity.

We have induced discharge of spermatozoa in the laboratory by injections of dilute liquids and by rapid absorption of water following drying. Hundreds of frogs were injected with 7 cc. or more of various liquids such as distilled water, tap water and pond water and over 50 per cent discharged mature living spermatozoa with their urines. Accordingly experiments were devised to determine the extent of these factors in influencing discharge of spermatozoa and their possible effects upon the use of male frogs in clinical practice.

METHODS AND MATERIALS

Except where otherwise stated, the frogs, *Rana pipiens*, used in these experiments were delivered by express from commercial dealers and placed in aquaria containing about one inch of tap water. These aquaria were then placed in a refrigerator where the temperature was maintained at approximately 45° F. They were used in the experiments from two to sixty days after refrigeration began. All injections were subcutaneous into the lateral lymph sacs. Microscopic examinations for spermatozoa were made by removing, with a pipette, a drop of fluid from the jars in which the frogs urinated after injections. If a frog failed to urinate after 90 minutes, pressure was applied to the sides of the frog which usually emptied the urinary bladder.

THE POSSIBILITY OF FALSE POSITIVE DIAGNOSIS

Robbins and Parker (1949), while checking the source of false positives when using *Xenopus laevis*, have found that *Rana pipiens* as well as *Xenopus laevis* responds to some adrenergic substances by emitting spermatozoa. However, since the adrenergic substances to which *Rana pipiens* responded are not known to be present in human urines they discount them as a possible source of false positives.

The absence of false positives in the literature indicates that if they occur they are recognized as such because of abnormalities in the animal or faulty procedures. Thousands of urines of frogs have been examined in our laboratory and, except for the conditions to be mentioned below, the indications are that frogs kept in the laboratory under conditions conducive to longevity do not discharge spermatozoa unless gonadotropic substances are administered.

One of the conditions to be mentioned is the effect of injections of large quantities of liquids. An experiment was carried out to determine the minimum quantity of water necessary to stimulate spermatozoa emission.

Four to twelve cc. of *distilled* water were injected into 14 frogs of average size and their urines examined for spermatozoa. The results are found in Table I. A separation of the March and June data indicates that the danger of false positives due to large quantities of dilute solutions is greater in March than in June; in other words greater before the end of overwintering than after the breeding season.

TABLE I

THE RESULTS OF INJECTIONS OF VARIOUS AMOUNTS OF DISTILLED WATER

Amount of cc. in Distilled Water	4	5	6	7	8	9	10	11	12	Totals
IN MARCH										
Number emitting spermatozoa	0	3	4	2	3	5	2	6	6	31
Number not emitting spermatozoa	7	4	3	5	4	2	5	1	1	32
Death	0	0	0	0	0	0	0	0	0	00
IN JUNE										
Number emitting spermatozoa	0	0	0	2	1	0	2	4	4	13
Number not emitting spermatozoa	6	7	7	5	6	6	5	3	3	48
Death	1	0	0	0	0	1	0	0	0	2

In order to check the possibility of obtaining false positives from large amounts of urines, 10 cc. amounts of human male and non-pregnant female urines were injected into thirty frogs. Since it has been our experience that a large quantity of urine usually kills the frog, we also decided to check the effect of a non-toxic saline solution. Ten cc. amounts of cold-blooded Ringer's solution were injected into 30 frogs. Thirty frogs, received in the same shipment and stored under the same conditions as the other two groups, were injected with 10 cc. amounts of distilled water. The results are found in Table II.

TABLE II

THE RESULTS OF INJECTIONS OF 10 CC. OF NON-PREGNANT URINES, RINGER'S SOLUTION AND DISTILLED WATER

Number of Frogs	Injected with 10 cc. of:	Results		
		Positive	Negative	Death
30	Non-pregnant Urines	0	12	18
30	Ringer's Solution	1	29	0
30	Distilled Water	18	12	0

An analysis of these data suggest a remote possibility of obtaining a false positive even with a large quantity of saline solution. It does not eliminate the possibility of large quantities of dilute non-lethal urines inducing emission of spermatozoa. This was observed under controlled conditions in our laboratory. It resulted when an injection of 7 cc. of dilute urine from a non-pregnant woman followed one hour later by an injection of 10 cc. of the same urine. This case was not considered a false positive because the abnormally high amount of urine injected would not have been used clinically.

Another condition likely to result in a false positive diagnosis concerns the condition of the frogs. Our experiments indicate that abnormally dry frogs may emit spermatozoa following their introduction into water. In the winter and spring of 1950 some frogs were placed in jars without water. When they had lost

about 35 per cent of their previous weight, water was added and four hours later their urine was found to contain mature living spermatozoa. Control frogs were subjected throughout the experiment to the same environmental conditions except that they sat continuously in about one inch of water. These frogs did not emit mature living spermatozoa.

Frogs are usually received from commercial suppliers with a near normal water content. Hundreds of these have been examined by us upon their arrival, after they were placed in tap water at room temperature, and after refrigeration. None have ever discharged mature living spermatozoa. However, when very dry frogs are placed in tap water after arrival in early spring they have been seen to clasp and an examination of their urines revealed, in some cases, mature living spermatozoa. This indicates the necessity of care in preserving the water content at all times, of a conditioning period if received dry, and of checking all frogs before their use as test animals for pregnancy. The checking is quite simple and is practiced routinely in many clinical laboratories.

CONDITIONS INFLUENCING FALSE NEGATIVES

A false negative diagnosis may arise from a low sensitivity of the frog or an insufficient amount of gonadotopin, or a combination of both of these conditions. The lowest percentage of false negatives occurs from urines of women in the first trimester of pregnancy. It was shown by Miller and Wiltberger (1948) that there is a declining and fluctuating amount of chorionic gonadotropins after the first trimester of pregnancy. Bodine et al (1950) reported no negative responses

TABLE III

THE INFLUENCE OF CHORIONIC GONADOTROPIN ON EMISSION OF SPERMATOZOA AT VARIOUS TEMPERATURES

Temperature of	60	67	75	85	95
Number emitting spermatozoa after 90 min	17	19	16	11	11
Number emitting spermatozoa after 120 min	17	19	18	16	12
Number in which death occurred	0	0	0	0	4

from the first trimester of pregnancy. They also found the amount of chorionic gonadotropin was highest during the 2nd and lowest during the 6th month of pregnancy.

From these investigations it appears that maximum accuracy should be obtained by using urines from the first trimester and by using concentration procedures, which increase the amount of gonadotropins without injecting large quantities of solution. Wiltberger and Miller (1948) suggested the possibility of a seasonal variation of the frogs and Sampson (1950) reported a seasonal sensitivity to chorionic gonadotropin.

Some experiments were carried on by us which indicate that the sensitivity of the frog can be influenced by several factors under the control of the technician. The results of our investigations with liquids and chorionic gonadotropins in the summers of 1948 and 1949 indicate that the frogs did not emit spermatozoa as often when they were placed, after injections, in a room where the temperature was high (i. e., 90° F.). In order to determine whether the temperature at which the frogs were placed during the test was a factor in their sensitivity, we injected Ayerst brand of "Anterior Pituitary-Like" chorionic gonadotropin in amounts of 50 and 100 International Units, diluted to 2 cc. with distilled water, into each of 20 frogs over a range of five different temperatures. No significant difference was observed between those injected with 50 International Units and those injected with 100 International Units. The results are shown in Table III.

At temperatures below 60° F. considerable difficulty was encountered in getting the frogs to urinate within an hour's time. From these data it appears that the optimum temperature is around 67° F. This experiment was carried out in August, 1949, and at this time of the year, even with optimum temperature, some frogs remained negative after injections of a large amount of gonadotropins. The data also suggest that an increased length of time after injections is necessary before emission of spermatozoa by leopard frogs standing in temperatures above 75° F.

Another experiment indicated that an additional factor in their susceptibility to gonadotropins is the temperature at which the frogs have been stored. Frogs

TABLE IV

COMPARISON OF THE EFFECTS OF GONADOTROPINS ON EMISSION OF SPERMATOZOA BETWEEN FROGS STORED IN A REFRIGERATOR AND THOSE STORED AT ROOM TEMPERATURE

Number of Frogs	Kind of Storage	Number Emitting Spermatozoa
20	Refrigeration	13
20	Room Temperature	1

TABLE V

COMPARISON OF THE EFFECTS OF DISTILLED WATER ON EMISSION OF SPERMATOZOA BETWEEN FROGS STORED IN A REFRIGERATOR AND THOSE STORED AT ROOM TEMPERATURE

Number of Frogs	Kind of Storage	Number Emitting Spermatozoa
30	Refrigerated	16
30	Room Temperature	4

TABLE VI

COMPARISON OF THE EFFECTS OF DISTILLED WATER AND PREGNANCY URINE ON SPERMATOZOA EMISSION OF FROGS STORED IN DRY REFRIGERATION

Number of Frogs	Injected With	Number Emitting Spermatozoa
4	13 cc. of distilled water	3
5	4 cc. of pregnancy urine	0

from one shipment in May, 1950, were divided into two groups. One group was stored in a refrigerator (about 45° F.) and the other at room temperature (about 74° F.). Both groups were in one inch of water.

They were all injected with 1 cc. of Ringer's solution containing 5 International Units of Ayerst Brand of Chorionic Gonadotropin ("APL"). The Summary is found in Table IV.

It appears from this experiment that refrigerated frogs are much more sensitive to gonadotropins. It also appears that 5 International Units is close to the minimal dosage of gonadotropin necessary to cause emission of spermatozoa in May frogs.

In a similar experiment 12 cc. of distilled water was substituted for gonadotropins. The results are shown in Table V.

From these two experiments on the temperature of storage it appears that refrigerated frogs are better test subjects but consequently more susceptible to over-injections.

In a preliminary experiment 10 frogs were refrigerated (in an aquarium) without water and the effects of injections of distilled water and pregnancy urine on emission of spermatozoa were compared. The gonadotropic potency of the pregnancy urine used was tested on five frogs stored in a refrigerator in one inch of water and all five emitted spermatozoa. A preliminary test gave the results shown in Table VI.

Although the number of animals used in this experiment is small the results seem to indicate that dry frogs are not good test animals. They are not only less sensitive to gonadotropins but are more sensitive to distilled water.

CONCLUSIONS

From the foregoing experiments we suggest the following ways of improving the accuracy when using *Rana pipiens* as a test animal in clinical diagnosis of pregnancy.

1. Do not use more than 5 cc. of fluid if possible in a single injection. Quantities of distilled water and very dilute solutions have caused some emission of spermatozoa.
2. Always use a salinity as near to normal (Ringer's solution) as possible. Non-pregnancy urines and cold Ringer's solution showed little danger of false positives even when quantities of 10 cc. were injected.
3. Avoid large quantities of fluids in autumn, winter and early spring especially. The frogs are more sensitive to excessive quantities in these seasons than in summer.
4. Avoid excessive drying of test animals before using. Frogs that stood at room temperatures until they had lost about 35 per cent of their weight by drying were then placed in water for four hours, after which some emitted spermatozoa.
5. Store frogs in shallow water and in refrigeration if possible. Such frogs are more sensitive to gonadotropins than those stored at room temperatures.
6. Run tests at 60° F. to 75° F. if possible. The reactiveness of the frogs decreases at temperatures above and below this range.
7. By concentrating and extracting the hormones from the urine greater accuracy may be obtained without injecting large quantities into the frog.

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LEADERSHIP IN LOMA: A PRELIMINARY RESEARCH REPORT[1]

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"Loma," "Justino" County, Southwest, is a relatively isolated community of some 200 people, most of them Spanish-speaking, the rest of them "Anglos," that is, non-Spanish, English-speaking "Whites." From an earlier paper on culture change in Loma,[2] the Spanish culture of that community appeared to be changing in the direction of the surrounding Anglo culture, with a concomitant loss of original characteristics. The topic of the present paper, leadership, suggests the adoption of an explicitly diachronic view: the "new," Anglo-influenced Loma system is contrasted with the "old," almost purely Spanish one.

At this stage of investigation, fifteen leadership types have tentatively been established. Eight of them function within the "old," and seven within the "new" system. "Old" types are the religious leader, the community leader, the man of knowledge and wisdom, the *patrón*, the *médico*, the *curandera*, the *hechicero* (*brujo*), and the prostitute; "new" types are the contractor, the creditor, the priest, the physician, the nurse, the leader in education, and the community planner. Some of the old-type leaders, of course, have left traces in the present set-up.

The *religious leader* is well exemplified by Sigismundo Campa. Some of his leadership characteristics include his organizing role in home services, his instrumentality in the building of the church (after which home services practically ceased), his influential functioning as a member and official of various religious organizations, and his wife's catechism teaching. His leadership activity is thus the development or articulation of a certain institution, religion, whereby in some respects, one of which has been mentioned, his influence is enhanced through his wife's sharing it. His wife, however, is here conceived by the Lomans merely as a person to whom some of her husband's leadership has been delegated. The religious leader does not occupy an "office" of leadership: there is, in Loma, no such office or position called "religious leader." It is rather the personality of this particular individual which makes certain activities within the institution of religion, leadership activities. As to the question whether the religious leader "belongs" to the old or the new Loma, it should be noted that an individual's seizure of available institutional opportunities for leadership is, by itself, no more characteristic of the old than of the new system. What does characterize the old system is the fact that the institution chosen is that of religion. Other types of leaders use other institutions, which are more characteristic of the new system.

[1]Field work in Loma was done in 1942 and 1944; in 1944, on a Social Science Research Council fellowship. Writing up was begun in 1948 and continued in 1949, under grants from The Viking Fund, Inc., and the Graduate School, The Ohio State University. In the summer of 1947, a graduate student spent several weeks in Loma under the joint direction of Dr. John W. Bennett and myself (all of Ohio State University); material collected by this student is part of the sources utilized here. To these organizations and persons I gratefully acknowledge my indebtedness. My special thanks go to Richard T. Morris and Melvin Seeman for most helpful discussions, and to the field worker just mentioned (who for the sake of Loma's anonymity must unfortunately remain unidentified) for stimulating correspondence, regarding a first draft of the present paper.

[2]Kurt H. Wolff, "Culture Change in Loma: A Preliminary Research Report," *The Ohio Journal of Science*, 50: 53–59, March, 1950. See this paper, also, for a description of the Loma Institute and the Justino Plan referred to several times in the present study.

The *community leader* is similar, for he, too, is without office and develops existing institutions. He differs, however, not only because the area within which he exercises influence is not religion, but also because it is a variety of institutions, rather than one or two closely related ones. In the example at hand, Alejandro Maes, these institutions are education, economics, and justice. Maes gave the land on which the first school house was built, and for many years he was a member of the school board. For some time in the past, he was considered the best farmer, organized co-operative work at the seasonal times it was carried on by tradition, and took a lead in the administration of irrigation. For many years he was the justice of the peace. Yet although school board member, water commissioner, and justice of the peace are well-defined offices in Loma, Alejandro is a leader not because he occupies these offices, but, once more as in the case of Sigismundo Campa, because of his personality, particularly because of his Loma-wide interest. In fact, he probably occupies office because of his leadership, which endows his official actions with an importance that other office holders do not derive from their mere occupancy.

The same individual also is the *man of knowledge and wisdom*, a designation which refers to no office whatever, for the only related existing position is that of teacher, which has, however, always been filled by a woman. The area in which Maes exercises leadership in his capacity of man of knowledge includes that in which he acts as a community leader, but it is broader than economics, education and justice, since it includes many other, miscellaneous matters. His influence here consists in imparting knowledge and wisdom and in inspiring confidence and security through such communication. Nor does he carry on or articulate existing institutions; he rather perpetuates the whole perspective and orienting character of tradition.

In the cases of all three of these leaders, acts by others that are similar to those committed by them may be observed by the outsider, and may be classified as leadership acts. But they are not so defined by the Lomans: religious, community, and knowledge leaderships are given only to Campa and Maes, respectively.

The *patrón* represents a type different from those thus far considered. Not only is his office clearly established, but it also is of such a nature that it gives physical power to whomever holds it. Unfortunately, very little else is as certainly known about the office of *patrón* and of its characteristics as is this. For instance, it is not sure whether the *patrón* merely was the largest landholder who had hired men or tenants working for him, or whether he was a full-fledged feudal baron, on however modest a scale. In either case, because of the office he occupies, he exerts economic power. Adriano Orlando Maes, at any rate, the only-known (perhaps the only) *patrón* Loma ever had, Alejandro Maes' father, was a leader in many other respects as well. Several among these leadership spheres were probably not included in the definition of his office but were due, as in the cases of the leaders thus far described, to his personality. Adriano seems to have played a role similar to that of his son, inasmuch as he, in his day, was an over-all leader in an even more extensive sense than that in which Alejandro is or was: he preceded Sigismundo Campa in religious affairs; he had the welfare of the community at heart (for instance, he donated the land for the cemetery and in fact made and planted the first cross); he had influence in matters of education, health, various customs, and, of course, in economics; and he was generally the man of knowledge and wisdom. In the course of economic change, the office of *patrón* itself has disappeared, and the leadership associated with it by its particular occupant has been transmitted to other personalities, as has in part already been seen. It is safe to assume that in becoming plural, the leaderships also have become specialized, but not to the point of institutionalization in offices. It is true that now there are the offices of teacher, county agent (agricultural-economic), priest, physician, and more, but these have not developed historically from the *patrón*, but are all of them imported.

Because of the power connected with the office of *patrón*, its occupant has a position of leadership irrespective of personality. The *patrón* may therefore be called an "office leader," and his office may be said to give its occupant "office leadership." The following three leadership types that are characteristic of the old Loma system have certain similarities with that of the *patrón*. It is not clear, however, whether *médico*, *curandera*, and *hechicero* (*brujo*) are leaders merely by virtue of their respective offices, or whether anybody who exercises their respective functions and thus articulates the institutions of health and witchcraft, respectively, thereby becomes a leader. It is not clear, in other words, whether healing and witchcraft are offices, units in the institutions of health and, say, the sacred or magic, or whether they themselves are institutions. At any rate, in the case of the first two, it is not power, and in the case of the *hechicero* it is not physical or secular but sacred power, which makes them leaders. The *médico* performs the function of physician, particularly of psychosomatic physician, which, with the addition of midwife, also is the function of the *curandera*. But while the patients of the *curandera* are predominantly women and children, those of the *médico* are predominantly men. Both satisfy health needs, but they also have some measure of sacred power. This is more clear-cut in the case of the *médico* than of the *curandera*, for the former more clearly than the latter is the counter-agent of the *hechicero* (*brujo*), the practioner of witchcraft or sorcery. Witchcraft is as little a full-time occupation as is leadership in matters of religion, the community, and of general knowledge and wisdom. Nor is witchcraft altogether a specialty in the sense of exclusive monopolization by the witch, for certain arts of witchcraft, particularly casting the evil eye, are exercised by a number of other individuals, men and women. In a similar fashion, not all cases of bewitching require the services of the *médico* or *curandera*; often familiarity with the witch's tricks or special piety, possessed by several persons of both sexes, suffice to exorcise the spell. To repeat, it is difficult to decide, before the pertinent data are more carefully analyzed, whether the *hechicero* is an office leader or whether anybody who commits an act of witchcraft thereby, and for that time,[3] becomes a leader merely by virtue of his articulating the institution of witchcraft. A parallel question must be entered in regard to the *médico* and the *curandera*.

The *prostitute's* influence consists in the introduction to sex life and in the channelization of the evil component in human nature. The former influence refers to younger boys, but the latter to mature people and, though differentially to men and women, not to men alone. It is uncertain, in fact, whether Lamberta had many or even any regular customers among those whose sex life was settled, especially through marriage. But her influence is nevertheless felt among fellow villagers in their treatment of her, which takes cognizance of her role and yet is friendly and respectful. There are good grounds for believing that prostitution is, or rather was, an institution. If this is correct, there is a further case of office or institutional leadership.

In Table I, five aspects of the leadership types characteristic of the old Loman system are brought toward greater, even if still preliminary and tentative, systematization. Two of these aspects, presented in the last two columns, have not been specifically discussed but will be understandable from the discussion given. It should be observed that in the case of the *patrón*, the office, rather than Antonio Orlando Maes' occupancy, has been analyzed. It will further be noted that a concept so often discussed in connection with leadership, that of status, has not specifically been treated here. By implication, however, a certain aspect of it can easily be inferred from the fourth column of Table I: this column in effect says that within the area described in it, the respective leader has the highest status, although

[3] "Leadership," of course, does not imply continuous leadership action but only recognized availability (of person or office) for such action.

other individuals may exercise influence within the same area. Thus, in the area of religion, the religious leader has the highest status, but other persons may, and in fact do, have religious influence as well—as is true, for instance, not only of particularly religious individuals but also of such more institutionally defined

TABLE I

ASPECTS OF LEADERSHIP IN THE OLD SOCIO-CULTURAL SYSTEM OF LOMA

LEADERSHIP	RELATION TO INSTITUTION(S)	PERSONAL, OFFICE, AND INSTITUTIONAL ASPECTS	AREA OF INFLUENCE	MEANS OF INFULENCE	ETHICAL ASPECT
Religious	Articulating available institution(s) (religion, church)	Personal	Religion	Precept and interpretation	Good
Community	Articulating available institutions (economics, education, justice)	Personal	Community affairs	Precept and advice	Good
Knowledge and Wisdom	Perpetuating perceptive and orienting aspects of tradition	Personal	Knowledge and wisdom	Advice	Good
Patrón	Fixing power distribution	Office	Power	Physical power	Neutral
Médico	Articulating institution of health	Office or Institutional	Men's health	Superior knowledge and sacred power	Good
Curandera	Same	Same	Women's and children's health	Same	Same
Hechicero	Articulating institution of witchcraft	Same	Magic	Sacred power	Bad
Prostitute	Channelizing aspects of sex and of evil	Institutional	Sex and ethics and morals	Potential and actual physical contact	Compensated; choice of the relatively better for the relatively worse

persons as the officials of religious organizations; but these are not considered leaders. The peculiarity of the first three leaderships, as has been stated, is that their respective areas are defined by the Lomans in terms of the leaders' personalities. "Highest status," therefore, here is synonymous with "only status," inasmuch as no other person has status at all. Comparable ramifications could be

formulated in regard to the other areas of influence. At any rate, status refers to a leader within a given area, not to leadership.[4]

Before presenting new-system leaderships, several questions must be discussed. One concerns a definition of "leadership" itself: it refers to the exercises of significant influence within a socio-cultural system—Loma is conceived as such a system. If the leadership types discussed are inspected, it appears that "significant" influence refers to one which affects the system itself—corroborating it by confirmation or articulation, questioning it, or changing it. (In the present case, there are instances only of corroborating influence. The system has changed, not because of leadership but because of other reasons, as was indicated, especially in the paper on culture change referred to in note 2 above.) Leadership thus must not be confused with other influences within a system, which, of course, are innumerable. In the first place, in addition to affecting the system, it must also be concentrated, rather than diffused. It may be concentrated in an office or institution, or in a person, instances of all of which are found in Loma. But farmers, fathers, mothers, etc., exert influences and thereby affect the system in Loma once more in the corroborating sense. They are not considered leaders because their influences are not concentrated. Thus, one connotation of the fact that prostitution is breaking down as an institution is the diffusion of the occupant's influence, a phenomenon that is widely observed in contemporary urban cultures also.

In the second place, there is no leadership office alone. Suppose the office of *patrón* is vacant. In such a case, leadership by mere occupancy has been replaced by an impersonal portion of the socio-cultural system, the distribution of power and land (and concomitant customs, beliefs, etc.). It may be added that since this particular portion of the system involves power, it will, after a relatively short time, either be personalized (by occupancy) or abolished (by some socio-economic change). But by itself it constitutes no leadership, although it does, even without the occupant's co-operation, bestow it upon him. Thus, leadership is seen to have a further requirement, namely, that it be exercised by an individual.[5] Moreover, the leader must be a living individual. If, for instance, a person says, "Christ is my leader," he may actually have no leader whatever (if he should really "live by" nothing then Christian doctrine, which is extremely improbable) but is talking about a value system or a religious conviction, in short, about his culture; or else he actually has other leaders, such as his wife or a teacher or a minister. With his death, Christ ceased to be a leader. He was later replaced by the church, an institution with many offices and office leaderships in numerous socio-cultural systems other than itself—among them, in Loma (though in a more articulate, even if weaker, fashion, only in its new phase).

How does the student of a system know—it may be asked—what leadership positions meet the requirements developed? Obviously, he must have a certain knowledge of the system itself before he can even develop hypotheses regarding the concentration of influences that act upon it. Space permits no more than a few, rather apodictic remarks, which are, however, necessary to further the

[4] In the latter case, status could only denote the position of a particular leadership within an order of leaderships. This usage is not employed in the present paper, although some of the following discussion might suggest it. Furthermore, no more refined analysis of the leader's status has been undertaken, such as would be entailed by a differentiation of statuses into "subjective," "objective," "specific," "general" (all to be defined), or what other subdivisions might seem desirable. The reason for this failure is not skepticism concerning the utility of such subdivisions, but once more the present stage of analyzing the data. Toward the end of this paper, however (n. 10 and text preceding it), a scheme will be presented which suggests a certain classification of leader statuses.

[5] There is no reason why it could not be exercised by a group, a clique perhaps, but no such instance was found in Loma.

argument.[6] The student identifies himself as best he can with the system he is studying. He will thus eventually get some sort of picture which has elements existing on the part of the participants in the system, and others existing on the part of the student. The presentation itself of the picture he has gained amounts to its translation into his and his readers' culture. No Loman, for instance, would ever dream of thinking up Table I, nor can he understand it, unless he is familiar with anthropological or sociological thought. But in that case, his culture would have been enriched or replaced by another, precisely, by the current social-science universe of discourse.[7]

In the "new" Loma system, the leaderships—to repeat—are contractor, creditor, priest, physician, nurse, leader in education, and community planner. They can be discussed much more briefly, in part because they are more similar to one another than are the "old" types, in part because they are well known to the readers of this paper. With the exception of the last two, they are office leaderships. The *contractor* (Patricio Campa, a nephew of Sigismundo, the "old" religious leader) and the *creditor* (the Anglo trader) have taken over most of the economic functions, and thus of the power, that once were part of the *patrón's* leadership. The *priest* (an Anglo) has to a considerable extent replaced the religious leader; the *physician*, the *médico*; and the *nurse*, the *curandera*. But Sigismundo Campa still plays some role, and the officials of the religious organizations combine minor office leadership with reminiscences, both on their own part and on the part of those with whom they interact, of a less institutionalized, more spontaneous and personal religious life. Neither have the old-time representatives of health and un-health completely died out: some old people still resort to traditional medicines and cures, with or without the help of *médico* or *curandera*, believe in witchcraft, especially the evil eye, and take prophylactic and therapeutic measures against it, although a *hechicero* has not been known in the community for a long time.

The *leader in education* is represented predominantly by the public-school teacher, but also by government officials (such as the county agent), whose efforts, on the whole, consist in using educational measures for bridging the gap between the old and the new systems. During the existence of the Loma Institute, some of its staff members, especially the president and his wife, exercised a tenuous and short-lived personal leadership, largely if not wholly irrespective of either the institution of education or of the newly created Institute itself. While there is educational leadership due to the permanent existence of school and various governmental agencies, there was *community planning* only during the existence of the Loma Institute and the Justino Plan; and here again, the leadership was exercised by the Institute's president and his immediate staff. He took it over from the Plan with its seat in Justino, exercised it locally, and had begun to delegate some of it to certain villagers. With the demise of the two organizations, however, the function of community planning itself died out, too.

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[6]Cf. Kurt H. Wolff, "A Methodological Note on the Empirical Establishment of Culture Patterns," *American Sociological Review*, 10: 176–184, April, 1945.

[7]The old-system leadership presented can be contrasted not only with that of the new system, but also with systems outside of Loma. The most fruitful manner of undertaking such a more general comparison would probably be to refine the dimensions described in the columns of Table I in order to make them more clearly defined; this almost certainly would involve revisions and additions. Once some such improvement is achieved, however (and it is hoped that the further analysis of the Loma materials itself will contribute toward it), a usable typology of leaderships may be looked forward to. Yet the variables and their articulations as suggested in Table I are so numerous that, from the standpoint of economy, a more advisable procedure might be to begin, rather, with a typology of socio-cultural systems. For, in this manner the multidimensionality of the leadership typology might be reduced in consideration of empirical requirements. The possibility of socio-cultural systems without leadership (in the specific sense defined) should not be overlooked in such an undertaking.

If this is correct, why should these processes have occurred? This question suggests a further analysis of the relation between leadership and the socio-cultural system, Loma. The system, it has been shown over and over, has been changing to the extent of imposing upon its student the distinction between an old and a new phase. Yet despite the fact (documented in the paper on culture change referred to before) that the contemporary Spanish culture of Loma—at least of the younger generation—is indeed a mixture of Spanish and Anglo elements, leadership in the old system strikes one as somehow more effective than in the new. One suspects something that is common to all the old-system leadership types, in spite of the differences among them that have been pointed out; and conversely, one suspects something common to all the new types. This common feature may tentatively be stated as the fact, in the old system, that the relation to the leader is an "end" relation, because leadership, whether of office or of person, is the implementation of an unquestioned common-value system. And it is the contrasting fact, in the new system, that the relation to the leader is a "means" relation, not because leadership is in conflict with (or irrelevant to) a value system which would correspond to the new system, but because there is no unquestioned common-value system that is developed to a point where it could be implemented by leadership. The personal leaderships in religion, the community, and knowledge were accorded their representatives because the practice and promotion of religious tenets and rituals, the solution of community problems or of individuals' problems that bore on the community's welfare, and the dispensation of knowledge and wisdom through personally skillful resort to tradition were values in Loman culture, ends sought for their own sake. It was good to be pious, to have questions answered that referred to one's own welfare in its relation to that of the community, as well as to many other matters concerning which knowledge or wisdom were deemed good. It was good to be or to serve the *patrón*—merely to resent him as an oppressive power would not have made for stability.[8] It was good that there should have been a *médico* and a *curandera*, for both helped restore health, and even though they were used as means to attain this end, their occasional failure showed that they were not human means but God's instruments for showing his will, and thus they had to be dealt with as ends in themselves. It is likely that the sacred power attributed to witchcraft and to the *hechicero* permits the application of a similar dialectic by which he, too, is seen to have become an end; but the precise process in which this might have been brought about is not known, at least not at this stage of analysis. Finally, although it was bad that man should have an evil component which shows itself especially in his sex appetite, it was good that there should have been a prostitute, for this institution controlled the appetite, and the person who performed this function therefore imposed respect.

There are some further implications of the old leadership type which must be brought out before it is contrasted with the new. One is that the old leader had to make little use of coercive power. The other is that the possibility of maintaining end relations with the leader was facilitated by the smallness of the community. This also provides the opportunity for "over-all" relations with him: people knew the religious leader, the community leader, the man of knowledge, even the *patrón* and the prostitute, not only in these capacities (in fact, it was mentioned that the second and third leaderships were lodged in the same individual) but in many others as well; they knew them as fellow citizens generally. The concomitance of over-all and end relation does not apply so clearly to the *médico*, the *curandera*, and the *hechicero*, because their specializations usually were

[8] This statement illustrates (rather than contradicts) the ethical characterization, "neutral," of the *patrón* office, as given in Table I. The office itself is neutral, but may be defined in a given culture as good or bad, according to whether it is accepted or resented. It can be accepted (rather than merely accommodated to for a time) only if it is incorporated as a value in the culture, that is, presumably, in a certain number of certain individuals.

too expensive for one community to support. It is probable, therefore, that end relations were maintained with them in several communities, while over-all relations developed in only one of them, in their place of residence.

A third point concerns political leaders. It will be noted that they are listed neither in the old nor in the new system. Yet *políticos* have been known to individual Lomans since long before the old system began to change. In spite of this familiarity with the type, the politician seems never to have played any leadership role, especially perhaps because there has never been a local *político*. The *político* is defined as an individual who plays politics on the side, as a part-time specialist. He throws dances and hands out liquor and is paid for it by the political machine. But he is not a boss, and no trace of bossism has been found that would have reached into Loma, much less have centered there. He can be called a leader only if the area within which he so functions is clearly understood not to be connected with the common-value system, although the common values apply to the treatment of the politician as a person as they do to that of all others, leaders or no. The politician, along with the *patrón* and the religious leader, tied (however tenuously) Loma to the outside Spanish world which was governed by politics and by comparatively far-flung economic, power, and religious relations. How little politics is part of the common-value system is shown by the fact that even one of the most specifically political acts, casting the ballot, is not governed by it but by other values, especially by family and similar traditions.[9]

Behavior of this sort has been labeled "individualism," but this is a misnomer. For it is governed, not by more or less self-relying decisions but by common, though not by political values. Nevertheless, there is individualism in Loma, that is, behavior on personal rather than on common premises. Individualism governs personal relations where these are not governed by the common values—religious, familial, communal, etc. It does not govern relations when these have the capacity of maintaining the social order. The order is accepted, which is as much as to say, a value is valued. The individual as such is appraised and esteemed or not, according to the appraiser's own value system. Mr. McIntire, the trader, is not highly esteemed, but he is often chosen as one of the water officials, because both the regulation of the water and harmony with the creditor are valuable, and also because Mr. McIntire has proved satisfactory in the office of ditch boss or water commissioner. Lomans thus distinguish various roles of the same person. Office roles are defined, and a given individual, if the system makes him a candidate for a certain office, achieves it by rules that themselves are part of the system. Office roles are probably more numerous than are personal roles. These, in turn, are considerably less clearly defined, and their attainment depends much less on the system, since this system here only limits the range of individual achievement on the part of both role player and participant or participants in the relation to which the role is relevant.

All this is pertinent to leadership not only in the old, but also in the new system. The most general statement that can be made about the new order is that all of the characteristics of the old are either absent or in a state of confusion. That there is no common-value system that is implemented in leadership types has been anticipated. There are no leaders, in other words, to whom relations constitute ends rather than means. It may be added that the relatively neat distinction between office roles and personal roles, with their differential ascription and achievement and their relations to common and personal value systems, has

[9] Thus, one of the women who were most in sympathy with the Institute's viewpoint, who was most interested in national affairs, who, in fact, had assumed some leadership in putting over communal, educational, and health plans originated by the Loma Institute and Justino Plan, and who had consistently expressed her agreement with the New Deal and with President Roosevelt, voted the straight Republican ticket because her nephew ran for county office.

disappeared, because the cohesive principle of the old society and culture, a common-value system, has been succeeded by another principle, the desire to overcome insecurity or impotence and to gain security or power. But since this is not a cohesive principle, it can not function as the old one did.

The contractor and the public-school teacher (as well as sometimes a doctor or a nurse) are the only Spanish leaders characteristic of the new system. For this reason they are less mere means than are the remaining leaders, all of whom are Anglos and, with the exception of the creditor and the Institute president while he was functioning, non-residents. It is understandable, therefore, that the relations with the contractor and the teacher should be less specialized and more over-all than are those with the other types. And although the office and personal roles of Patricio Campa, the contractor, and corresponding relations to him can be clearly distinguished from one another, his office itself has not gained the dignity of the older offices. The contractor does not implement a value; he provides a job. On the other hand, Filiberta Tejada, the teacher, is merely a specialist who otherwise is a Loman woman. Attitudes toward her as a specialist vary with the conception of education itself as something uninspiring that has come to be taken for granted or as an imported imposition of doubtful merit or as a prestige-giving acquisition. In no event is it a common value which the teacher would implement.

Relations with the remaining types are predominantly office relations, though not exclusively. To the extent that they are, they are specialized rather than over-all. The purest exemplification of a "means" relation is that with Mr. McIntire. Although differing from individual to individual, it is characterized, both on the part of the Spanish people and on his own, by bargaining. It is perhaps because of the area within which this relation obtains, economics, that it shows the new type of leadership in such purity, for it is harder to reduce the relation with and of the priest, the physician, and the nurse, to pure bargaining. The priest's office has all the dignity required to implement a common value, but here it is the occupant who falls short of his office. Yet it must be observed that already the priest's is no longer only an office leadership, since the office itself has lost significance. Church attendance is an indication of this, as are statements made both by the priest and by numerous Lomans of both sexes and various ages. Religion is no more a common value for all Lomans. Those who participate least in the old system (a group which to a considerable extent, but not entirely, is composed of the younger men) find religion least satisfying and are either confused or motivated individually by a quest for economic security or power.

The physician and the nurse are used, if at all, as means to attain the specific ends for which their respective offices equip them (though not with the bargaining characteristics of the creditor relation), or are received or resorted to with diffidence and suspicion as foreign importations (somewhat less so in case they are Spanish), or are treated as if they were *médicos* or *curanderas*. The relations to them thus are either specialized or confused. And finally, what influence the short-lived educator and community planner from the Loma Institute had was based on personal relations rather than on the establishment of common values and on participation in them. What, if anything, he had created in the way of offices thus disappeared with the removal of his person.

Before coming to a conclusion regarding leadership in Loma and implications for our own society, it may be clarifying to summarize the characteristics of leadership discussed in reference to Loma, but presumably applicable generally.

(1) Definition of leadership: the exercise of influence within a socio-cultural system, which influence (a) affects (corroborates, questions, changes) the system, (b) is concentrated in an office (institution) or person(s), rather than being diffused, and (c) is exercised by a person (or by persons) living within (or possibly outside) the socio-cultural system at the time the system is a going concern.

(2) The type of leadership is determined by its (a) relations to an institution or institutions within (or outside) the system, (b) being office (institutional), or personal leadership, (c) its area of influence, (d) its means of influence, (e) its ethical aspect or aspects, whereby (c) through (e) must be analyzed as office and personal characteristics in accordance with the information required under (b).

(3) The type of leader himself is determined by (a) the relations obtaining between him and other, differential individuals and groups, whereby end and means relations, over-all and specialized relations, and social and personal relations must be distinguished; (b) the roles played by him, which may be office roles or personal roles; (c) his status which, by definition, is the highest (or only) one within a given area (or areas) of influence and which may be analyzed further (a step not taken in the present paper) in regard to subjective status (the leader's definition of his status), accorded status (the status given the leader by differential individuals and groups), and system status (the status accorded the leader by the student of the socio-cultural system in which the leader functions, on the basis of the student's construction and presentation of this system); (d) the way in which the leader attains leadership, for which knowledge of (a), (b), and (c) is pertinent, particularly in regard to the application of ascription and achievement to (a), (b), and (c) and their subdivisions.[10]

Table I sketched (2) (a) through (e) for all leadership types of the old Loma system. Subsequent discussion, set by (1), arrived at (1) (a), (b), and (c), and discussion transitional to a presentation of leadership in the new system and this discussion itself yielded (3) (a) through (d) and subdivisions, though without tabulation and even without analysis of all points. Yet a further aspect of leadership has been touched upon at length but does not appear in the above schema because it is not yet clear even to the point where it could be incorporated there. This aspect is the relation between the system of common values (as a part of culture, which in turn is part of the socio-cultural system) and leadership. All that can be done at the present stage concerning this apsect is to clarify its theoretical and methodological status.

(1) To grasp the relation between a "common-value system" and leadership is extremely important for an understanding of (a) culture change, (b) the failure or success of change measures introduced into a system, and (c) the stability or instability of a system.

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[10]The following schema is an abridgement of the last three paragraphs:

(1) Leadership defined as influence in a socio-cultural system which
  (a) affects system,
  (b) is concentrated (office, person),
  (c) is exercised by living person(s);
(2) Leadership type determined by
  (a) institutional relations,
  (b) office- or personal nature,
  (c) influence area
  (d) influence means } to be analyzed as office and personal characteristics;
  (e) ethical aspect
(3) Leader type determined by
  (a) relation:
    1. end, means,
    2. over-all, specialized,
    3. social, personal;
  (b) role:
    1. office,
    2. personal;
  (c) status:
    1. subjective,
    2. accorded,
    3. system;
  (d) attainment manner.

(2) The relation between the "common-value system" and leadership is not clear beyond the observation of cases in which the latter seems, and does not seem, to "implement" the former; nor is the connection between "end relations" and "common-value system" obvious beyond the suggestion that both seem to "go together."

(3) The relation between the "common-value system" and "culture" is not clear beyond the suggestions, (a) that the former is the "most important part" of the latter, and (b) that it may be absent from it; nor is the connection between "common-value system," "area" (of influence), and "culture" evident.

(4) "Stability" and "instability" of a culture need definitions which must be undertaken in conjunction with efforts to define the relations between "culture," "common-value system," and "area," because it is hoped that such a combined attack may lead to satisfying the quest for understanding indicated under (1) above.

This quest has been at least one of the motives for studying Loma in general, and its aspects, among them leadership, in particular. The idea has been, and still is, that once a unique culture is grasped—and the culture of Loma, like any culture, is conceived as a unique—an understanding of other uniques, including our own culture, will be furthered.[11] For, it is hoped that generalizations will emerge from such a procedure which are more tenable than are those derived from viewing Loma as a mere variant of our own set-up—a view that is based on the notion that people are "generally" alike no matter where they are. And it will have been noted that throughout the last portions of this paper, and particularly in some passages—such as in the descriptions of religious change and of voting behavior, problems have been discussed which can be seen, even at this stage in the analysis of the Loma materials, to be our own. More specifically, one of the most important problems which not only Loma and we, but the major part of the world have been and are facing is how to create a common-value system (whatever the definition of this term) which can implement types of leadership. Closely related to this problem is the question of how long a socio-cultural system can exist without doing more about this problem than asking how it might be solved.[12]

[11]Cf. Kurt H. Wolff, "The Unique and the General: Toward a Philosophy of Sociology," *Philosophy of Science*, 15: 192–210, July, 1948.

[12]A further methodological-theoretical note may be in order. If this paper makes any contribution to the study of leadership, it is through whatever theoretical suggestiveness it may possess, rather than through the rigorous application of a fully developed theory to empirical materials (for, many Loma materials have not yet been analyzed) or through methodological stimulation (hardly any methodology has been indicated). The following comments are offered to show a partial awareness of these shortcomings. The paper is descriptive rather than explanatory or analytical. To mention only two of the many "why" questions neither raised nor answered: Why was no "common-value system" the outcome of such concerted efforts as were made by the Loma Institute and the Justino Plan? Why did the *patrón's* son become a leader? Or, analytically: is there such a thing as inheritance of leadership? Is there "conversion" of leadership from one area to another? And most concepts in addition to those discussed in the last pages require further clarification and interrelation also.

BIOLOGY OF GASTROPHYSA CYANEA MELSH.

(Coleoptera: Chrysomelidae)

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One of the earliest insects to resume activity in the spring is a bright metallic blue or green leaf beetle which feeds on various species of *Rumex*. They have been observed feeding and ovipositing as early as April 3rd in the locality of Columbus, Ohio. This paper presents the life history and some of the external morphological characteristics of the larvae and adults.

Systematic Position and Previous Work

This beetle is a leaf feeding member of the subfamily Chrysomelinae, family Chrysomelidae, order Coleoptera.

The taxonomy of the genus is somewhat confused. Leng (1920) lists the genus as *Gastroidea* Hope, with *Gastrophysa* Redt. as a synonym, giving as authority the *Coleopterists Manual*, London, III, 1845, p. 164. Barber and Bridwell (1940) indicate that the genus should be known as *Gastrophysa* Chevrolat, as was adopted by Redtenbacher; these authors base their opinions on the third or 1837 edition of the *Dejean Catalogue of Coleoptera*.

The specific name *cyanea* was set up by Melsheimer in 1847. In his description the color is listed as "blue . . . scutellum green; elytra . . . with a green reflection;" this does not appear to definitely limit the species as to color, but since the word "blue" follows immediately after the species name in the description, the species *cyanea* probably should be considered as blue in color. A definite green form occurs in various parts of the country, however; McCracken (1906) after lengthy studies, concluded that the species contains both blue and green forms with the blue being genetically dominant. Blatchley (1910) describes *G. cyanea* as "Oblong-oval. Uniform brilliant green or blue."

Leng lists a subspecies or variety, *caesia* Rogers, from California, which is green. Goe (1918) listed his insects only as *Gastroidea caesia;* this work was done in Oregon and he may have been working with the green form of *G. cyanea*.

In this study, both blue and green forms have been used; they are considered hereafter as a single species, since there are no observed differences in habits or immature stages and none in the adults except color. Crosses were not made.

The previous life history work on this insect is rather sketchy. Girault (1908) records "the general outline of the cycle, together with a description of the egg." The incubation period and duration of larval stages are recorded in days and hours; the food plant is listed as "a species of *Rumex*." Color was not mentioned. The general paper by Goe (1918) contains notes on oviposition, incubation, and larval development. McCracken (1906) reared many of these beetles; however, the primary interest was in color and life history records were taken only in an incidental manner.

Distribution and Economic Importance

This beetle appears to be generally distributed in the United States and southern Canada. Leng (1920) lists *G. cyanea* as occurring from California to Indiana, and

[1]The writer wishes to acknowledge assistance received from the following people: Prof. D. M. DeLong, Ohio State University; Prof. Dwight Isley, University of Arkansas; Dr. M. W. Sanderson, Illinois Natural History Survey; Mr. John A. Wilcox, Ohio State University; and Mr. Ben H. Richardson, formerly of Ohio State University.

in Arizona and Connecticut. Goe (1918) stated that it occurred abundantly in the Pacific Northwest. Specimens have been collected personally in Ohio, Kansas, and Arkansas. There are numerous records from Ohio.

The beetles may become quite abundant in localized areas but are not found in every stand of the common *Rumex* species. Around Columbus they were found most often on *R. obtusifolius* but the points of infestation were rather widely separated. Flight was not observed and could not be induced, indicating that the insect probably increases its range only by walking.

Outside of occasional feeding on rhubarb (Essig & Hoskins, 1944) (Goe, 1918), these beetles are of very little economic importance. Their short period of activity and highly localized distribution prevent their being of much value as a natural control of the *Rumex* species which serve as host plants. Their slight occurrence on rhubarb probably does not make necessary the use of control measures.

Rearing Methods

Beetles were collected in the field and kept in Petri dishes for feeding and oviposition; fresh leaves of *Rumex obtusifolius, R. crispus*, and *R. altissimus* were supplied daily as food. Adults were also caged on plants of all three species in order to observe feeding and oviposition habits.

Larvae were reared in petri dishes, on potted plants, and on plants growing outside the insectary. Second and third instar larvae ate large quantities of food. As the feeding period ended, the petri dishes were filled two-thirds full with loosely packed soil for pupation. This allowed observation of the actual pupal period within the cell.

Feeding and Oviposition Habits

Adult Feeding

The adults usually make their first appearance on the lower surface of the leaves of the host plant. The preoviposition feeding period varies in length with the average daily temperatures following spring emergence. The overwintered adult females may live four to eight weeks.

The beetles feed at first on small patches of the lower surface of the leaf; later they feed along the margin, eating inward a short distance and progressing along the edge at the same time. Individually they do not consume a great amount of food.

Oviposition

Eggs normally are laid in compact groups on the lower surface of the leaves of the host plant, with most masses being placed along the midrib and often near the base of the leaf. If the beetles are crowded, they may deposit the eggs elsewhere.

The number of eggs per group averaged about 40; the maximum was more than a hundred. Field collected caged females averaged 1135 eggs each; the range was from 808 to 1435.

Larval Feeding

The larvae are also leaf feeders and develop rapidly when temperatures are favorable. The newly hatched larvae are pale yellow with black heads; they soon become entirely black. The first hatching larvae have been observed feeding on the other eggs in the group, although this does not appear to be of common occurrence. There are two ecdyses between hatching and pupation, with a resting or prepupal period preceding the pupa.

The larvae wander out over the under surface of the leaf almost immediately after hatching, settle in compact groups, and eat small holes in the lower layer of the leaf tissue. As the larvae feed, their black bodies enlarge, the thin pleural and intersegmental membranes become tightly stretched between the sclerotized plates and larvae become yellowish green in color. The upper surface of the

leaf may at times appear gray and translucent over the areas where the larvae have fed heavily.

The caudal end is usually anchored to the leaf by the anal sucker before the molts occur. The black exuvium is left upright on the lower surface of the leaf; this furnishes a good check on larval molting.

The second instar larvae also become black soon after molting, and they tend toward individual rather than group feeding. During this period these larvae spread out over the leaf and to other portions of the host plant, feeding and becoming lighter in color. The tissue of the leaf is destroyed, leaving only the branching framework of veins; this type of injury often resembles that of a skeletonizer.

The second molt also occurs on the under side of the leaf and is not unlike the first. The third instar larvae spread rapidly over the entire plant and to adjoining plants if they have not previously completed the movement. Leaves are often stripped down to the midrib and green seed stalks are denuded; in a stand of limited size, a large population of this insect usually reduces each plant to a stubby brown stalk with a few ragged leaf remains.

TABLE I

G. cyanea. Duration of Incubation Period, 1947

Temperature °C.	Incubation Period—Days			No. Eggs
	Average	Maximum	Minimum	
10.0 – 10.9	13.64	19	12	1,180
11.0 – 11.9	10.28	11	10	106
12.0 – 12.9	13.66	14	13	233
13.0 – 13.9	.....	...	...	.....
14.0 – 14.9	7.41	8	7	261
15.0 – 15.9	7.14	8	7	386
16.0 – 16.9	6.28	7	6	1,498
17.0 – 17.9	5.53	6	5	551
Total.....	.....	.....	.....	4,215

The mature larvae are yellowish green and measure about half an inch in length when completely fed. After only a few days of feeding, the third instar larvae bury themselves in the soil, usually at depths of less than half an inch; here a pupal cell is formed. The larva assumes a somewhat crescentis shape, becomes more or less immobile, and rests for several days. The pupal stage occurs in this cell.

Duration of Stages

The incubation period for 4215 eggs of *G. cyanea*, with temperatures ranging from 10° to 18° C. varied from 5 to 19 days (see Table I). The average incubation period for all observed series of eggs was 9.3 days at an average temperature of 13.2° C.

These eggs were deposited over a period of 6 weeks, from April 16 to May 27 inclusive. The great number of eggs hatching with an average incubation temperature of 10.0–10.9° was due in part at least to a cold wave which occurred during the early stages of this life history study. Hatching was delayed for several days; a relatively small rise in temperature then initiated the emergence of many new larvae.

The duration of all pre-imaginal (egg through pupal) stages may be summarized in the following table:

TABLE II

G. cyanea. Duration of Pre-Imaginal Stages (Days), 1947

	Stage					
	Egg	1st Instar	2d Instar	3d Instar	Pre-pupa	Pupa
Maximum.....	19	12	5	5	6	9
Minimum.....	5	3	3	2	2	4
Average.....	9.3	4.5	3.8	3.1	4.5	6.3
Totals*...	4,215	1,937	1,657	1,363	969	812

*This represents total number individuals in each stage.

The correlation of post-embryonic pre-imaginal stages with temperature is presented in Fig. 1. In this graph is shown the average time of development and the average temperature during that period for all larvae hatching on a given date. For instance, on the chart below, all larvae hatching on May 1st became adults after an average time of 30.26 days; the average temperature during this period was 55.7° F.

Description of Stages

The following descriptions of the stages are intended for comparative rather than taxonomic purposes; the descriptions are given as a means of recognition of this Chrysomelid species and do not necessarily separate it from others in the same genus.

Egg

Length, .93 mm.; width, .46 mm. These are averages based on measurements of 100 eggs taken from different egg masses.

Color light orange yellow, liberally to sparsely speckled with minute red particles. Shape elongate-oval, ends rounded, concave-convex in lateral view. Surface smooth, simple, and sticky when deposited; micropyle inconspicuous. Clear area in one end when deposited; this disappears as the embryo develops or increases in size when the egg is not fertile. Ocelli, mouthparts, claws, and spines show black through the chorion prior to eclosion.

Larva

Larvae are dark brown to black, becoming gray with approach of ecdysis; body widest at about 4th abdominal segment, tapering gradually cephalically and more rapidly caudally; body surface finely spinose, densely so in third instar, moderately in 1st and 2nd; body linear after hatching and each ecdysis, becoming crescentic in lateral aspect after feeding, with highest point over metathoracic and first abdominal segments.

Head dark brown to black, ovate-spherical, wider than deep, with mouthparts directed downward; epicranial and frontal sutures prominent; ocelli six, four slightly above and caudal of antennal fossae and two below and slightly forward; antennae 3-segmented, with accessory digit distally on second, beside the small third segment, which bears three tiny bristles apically; mandibles 5-toothed, palmate and cupped, mola absent; labium simple, fleshy, with "W" shaped darker sclerotized area extending cephalically between and partially around the bases of

the 2-segmented palpi; maxillae large and fleshy, bearing a single mala or lobe in place of galea and lacinia; mala dark, sclerotized, and bearing a row of short stout bristles on mesal surface; maxillary palpi 4-segmented; labrum present, hinged, short, wide, notched, and bearing a transverse row of setae just below the center line; clypeus short, with spines along lower margin.

Thorax half or more than half as long as abdomen; mesal tubercles bear single seta; others have one or more setae; meso- and metathoracic tubercles prominent, contain eversible glands and bear two setae each; prothoracic shield present, large, with marginal row of setae cephalically and scattered setae elsewhere; spiracle large, on mesothorax, situated on forward edge of segment laterally, adjoining tubercles just above base of leg.

Abdomen rounded, tapering caudally; all tubercles bearing 2 setae except dorsal on 7th segment; glands on segments 1 to 7 located in tubercles forming dorso-lateral row (3rd and most prominent row from dorso-meson) in 2nd and 3rd instars;

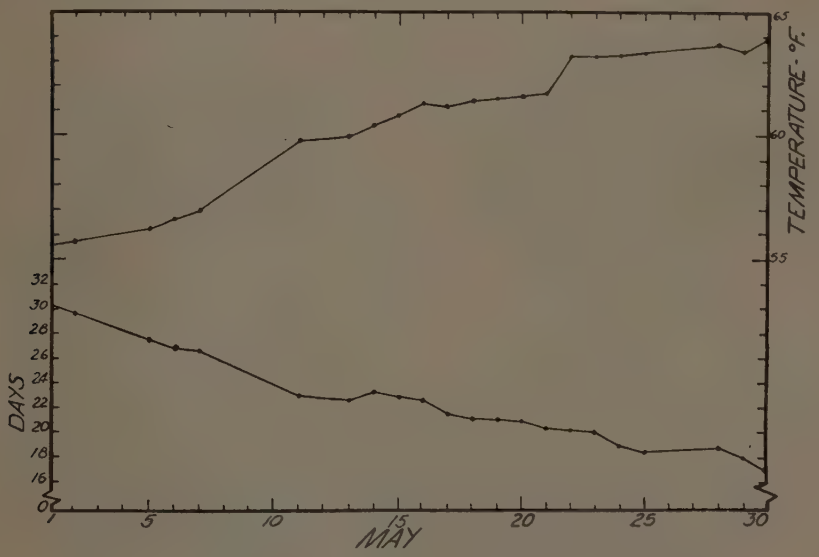
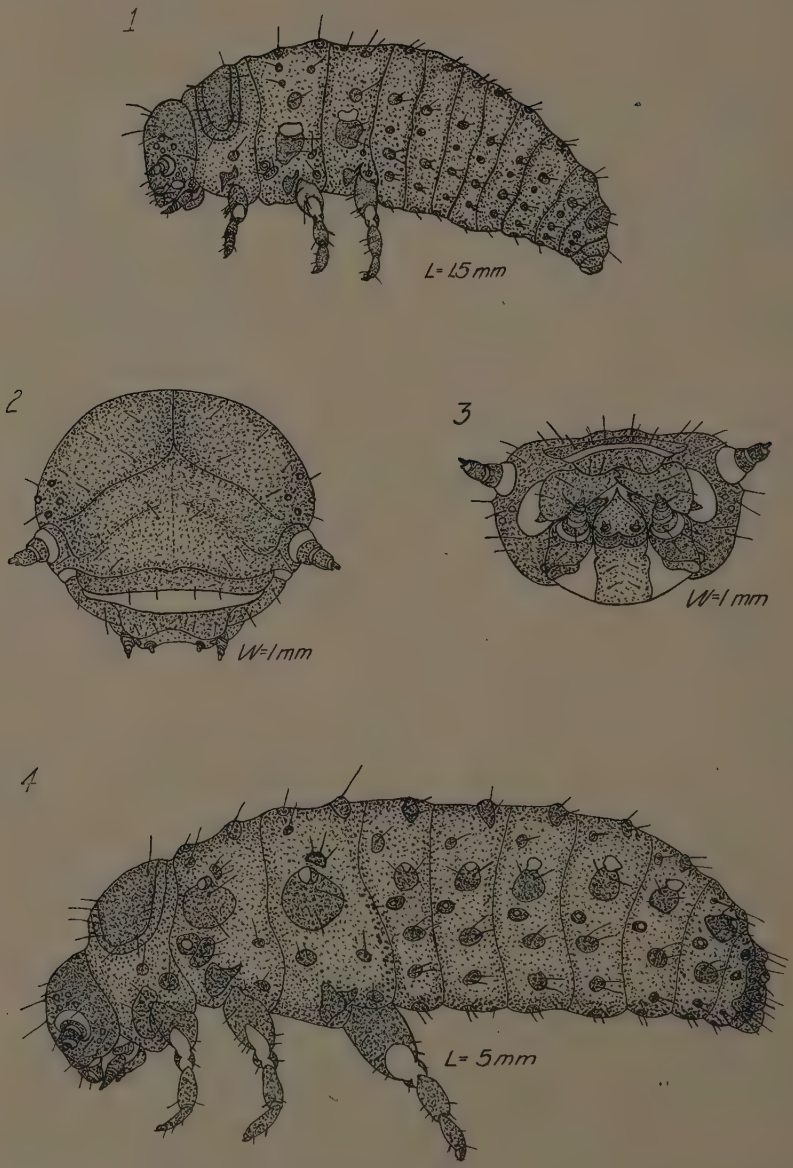


FIG. 1. *G. cyanea*. Correlation of Stages with Temperature, 1947.

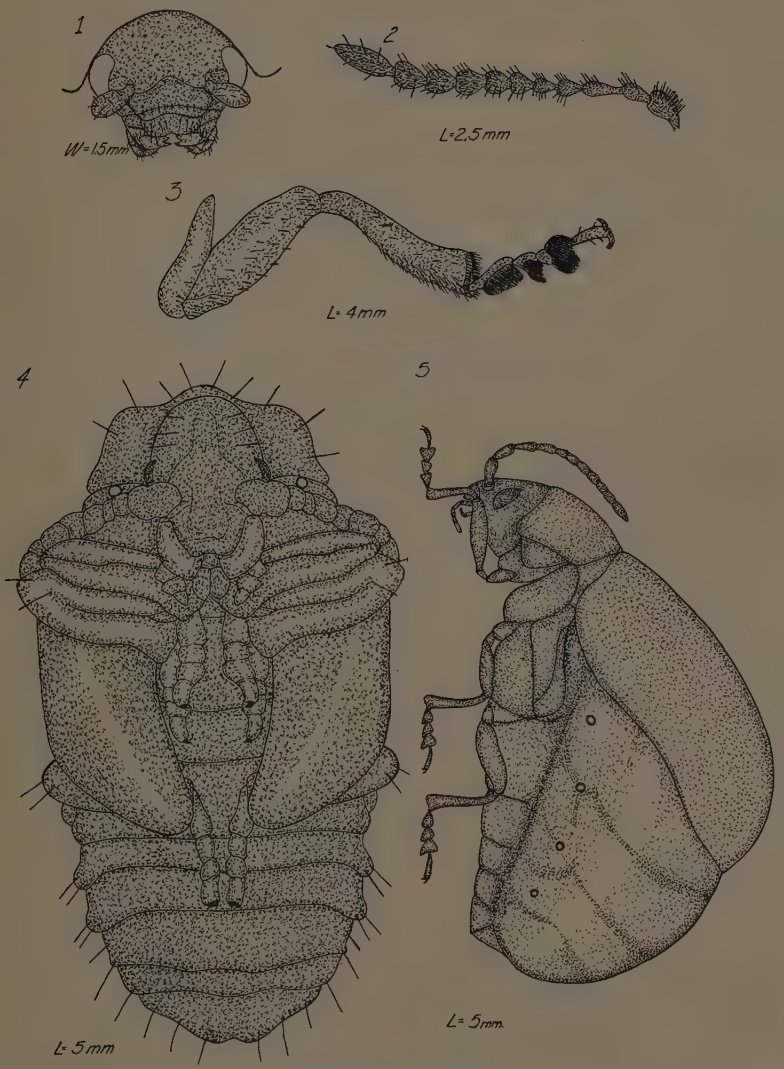
glands are present on same segments in 1st instar but are very small and apparently not eversible; two mesal tubercles on segment 7 fused into a single large one bearing 4 setae; 8th segment with no centrally located tubercle but with 4 setae located mesally along the caudal margin; 9th segment without tubercles, but with a marginal row of setae caudally, and somewhat shield-shaped; 10th segment inconspicuous, bearing anal sucker, which contains anal opening; spiracles annular, forming lateral row on segments 1 to 8 inclusive, located just below glandular tubercles; only two rows of tubercles present between spiracles and dorso-meson in 1st instar; 3 rows present in other instars.

Legs medium in length, 5-segmented, slightly elbowed at joints; coxa longest segment, broad, heavy; trochanter short, triangular laterally and open behind; femur short, thick, and shorter mesally; tarsus one-segmented, ending in a single claw which is situated beside a soft pad or pulvillus.



Gastrophysa cyanea M.

FIG. 1. 1st instar larva, side view. FIG. 2. Head, front view, 3rd instar larva. FIG 3. Head, ventral view, 3d instar larva. FIG. 4. 3d instar larva, side view.



Gastrophysa cyanea M.

FIG. 1. Head, adult, front view. FIG. 2. Antenna of adult. FIG. 3. Leg of adult. FIG. 4. Pupa, bottom view. FIG. 5. Female, side view.

Head capsules of 50 larvae of each instar were measured with an ocular scale micrometer. The widths of the head capsules by instar were as follows:

Instar	*Range (mm.)*	*Average (mm.)*	*Ratio of Increase*
1st	.45– .50	.47	.63
2d	.68– .87	.75	.70
3d	.98–1.17	1.07	

Pupa

Pupa yellow, exarate, more or less curved in lateral outline; appendages free, movable, and visible; head not visible from above; mouthparts directed caudally; pronotum turned ventrally, bearing two transverse rows of setae, cephalic and caudal on the segment; single setae on tubercles of thoracic segments; thoracic spiracle annular, on mesothorax at lateral base of pronotum; abdomen with 6 rows of tubercles (in 3 pairs of rows) visible dorsally; mesal pair of rows extending from 1st to 6th segments inclusive, spines on each tubercle large, 2 in number; lateral rows on segments 2 to 8 inclusive, tubercles most prominent, with 2 prominent setae on each; intermediate rows near to lateral rows, tubercles smaller, each with 2 less conspicuous setae; spiracles annular, visible dorsally on segments 1 to 6 inclusive; spiracles on segment 6 not so heavily sclerotized and less prominent than on other segments; row of spircales situated between lateral and intermediate rows of tubercles; abdominal segments 10 in number from dorsal aspect.

Adult

A short description of the adult of this species is given by Blatchley (1910).

Summary

The dock leaf beetle, *G. cyanea* Melsh., is an insect which overwinters as an adult, emerges very early in the spring, and feeds briefly but heavily on species of *Rumex* during a single generation of growth.

The abdomen of the female becomes greatly distended and she deposits many eggs. Delayed oviposition on the part of different females causes all stages to be present in late May and early June.

The larvae consume quantities of leaf tissue, then retire to just below the surface of the soil for a brief prepupal resting period, which is followed by pupation. The adults which emerge from these pupae occasionally appear above-ground for a brief period of feeding, but in general they remain within the pupal cell.

This insect is of little or no economic importance in Ohio.

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OHIO ROBBER FLIES V.

(Diptera: Asilidae)

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The following new records and notes concerning Ohio Asilidae are herewith set forth under 6 headings: (1) New Ohio records, (2) Change of name, (3) Unusual records of species not new to Ohio, (4) Zoomimesis, (5) Honeybee Prey records and (6) Literature cited.

1. New Ohio Records

Three species new to Ohio are here recorded bringing the total number of species known from Ohio to 94.

91. **Ceraturgus aurulentus** Fabricius. This rarest of North American Asilids was collected at a light-trap by John S. Thomas in Washington Twp., Jackson County, a few years ago and is now in the collection at the Ohio State Museum. The specimen was a male, but with antennae broken off. No date is available. This species was known as the "long-lost *aurulentus*." Described by Fabricius in 1805 from a New York specimen, it was not subsequently taken until Dr. C. W. Johnson collected one in 1892 at Westville, New Jersey. There are only 10 specimens known in collections. I have 3, one collected by Dr. Josef Bequaert in Van Cortland Park, New York City, without date (although probably 1919) and subsequently given to me; one collected by myself at Stamford, Connecticut, on August 2, 1936; and one taken by Dr. P. W. Fattig at Blood Mountain, Georgia, on September 17, 1939. Dr. Fattig very kindly donated this specimen to me. According to the Journal of the New York Entomological Society, Vol. 27, page 345, 1919 (Reference from Dr. Carl Parsons) another was collected by Mr. Burns at Singac, New Jersey. No date is available, nor is the present location of the specimen known. The New Jersey State list records 2 more specimens, one from Chester, and one from Trenton, July 7 (Harbeck). On August 17, 1925, a female was collected by W. W. Newcomb at Ann Arbor, Michigan, and is now in the University of Michigan Collection.

92. **Stichopogon argenteus** Say. This very small silvery species occurs on sand. Dr. Josef N. Knull showed me in 1947 a specimen collected by Professor R. C. Osburn in Ottawa County, August 7. (No year given). This was the first Ohio record, although it was known to occur elsewhere along the sandy shores of the Great Lakes. In 1949 Dr. Edward S. Thomas, Curator of Natural History, Ohio State Museum, collected a series of 5 males and 14 females on the dry loose sand just back from the beach of Kelley's Island, Erie County, August 25 30. Three were taken with prey; 2 with Chionomid midges, one with a minute cricket.

93. **Holcocephala fusca** Bromley (description to appear in American Museum Novitates). Taken in Texas, Tennessee and Ohio. The Ohio records are as follows: Beaver Pond, Adams County, August 7, 1948 (E. S. Thomas, J. S. Thomas, and S. W. Bromley), the following with prey: 5 with *Culicoides* spp., 1 with *Phortica* sp., and one with a minute Scolytid beetle.

Holcocephala fusca listed from specimens det. by S. W. Bromley, 1949, and in the Ohio State Museum as of Nov. 18, 1949.

Adams Co., Ohio, Aug. 10, 1935, Edw. S. Thomas—2
Adams Co., Ohio, Beaver Pond, Aug. 4, 1937, Edw. S. Thomas—2
Erie Co., Ohio, Castalia, Aug. 14, 1939, E. S. Thomas—1

Erie Co., Ohio, Huron Twp., Sept. 12, 1943, E. S. Thomas—1
Vinton Co., Ohio, Swan Twp., July 30, 1937, R. M. Goslin—1
Lawrence Co., Ohio, Aug. 18, 1929, J. S. Hine—1
Ross Co., Ohio, Andersonville, Aug. 17, 1941, R. M. Goslin—3
Ross Co., Ohio, South Union Twp., Aug. 25, 1941, R. M. Goslin—1
Ross Co., Ohio, Paint Twp., Aug. 16, 1947, W. E. Goslin—2
Hocking Co., Ohio, "Neotoma," July 26, 1936, E. S. Thomas, C. F. Walker—1
Union Co., Ohio, Marysville, Aug. 13, 1940, Clem Wolfe—1
Fairfield Co., Ohio, Flatrocks, Aug. 14, 1938, R. M. Goslin—1
Fairfield Co., Ohio, Flatrocks, Sept. 25, 1936, R. M. Goslin—1
Fairfield Co., Ohio, Berne Twp., July 15, 1939, R. M. Goslin—1
Fairfield Co., Ohio, Berne Twp., Aug. 13, 1936, R. M. Goslin—1
Fairfield Co., Ohio, Berne Twp., Aug. 10, 1936, R. M. Goslin—1
Fairfield Co., Ohio, Lancaster, Aug. 2, 1935, R. M. Goslin—1
Fairfield Co., Ohio, Lancaster, Aug. 1, 1936, R. M. Goslin—1
Fairfield Co., Ohio, Lancaster, Aug. 5, 1935, R. M. Goslin—1
Columbus, Alum Creek, Aug. 7, 1943, R. M. Goslin—2
Columbus, Alum Creek, July 4, 1944, R. M. Goslin—1
Columbus, Alum Creek, July 29, 1944, R. M. Goslin—1
Columbus, Alum Creek, July 11, 1943, R. M. Goslin—1
Columbus, Alum Creek, July 12, 1943, R. M. Goslin—1
Columbus, Alum Creek, July 31, 1943, R. M. Goslin—2
Columbus, Alum Creek, Aug. 12, 1947, R. M. Goslin—1
Columbus, Alum Creek, Aug. 15, 1943, R. M. Goslin—3
Columbus, Alum Creek, Sept. 7, 1942, R. M. Goslin—1
Columbus, Alum Creek, July 18, 1948, R. M. Goslin—3

94. **Diogmites missouriensis** Bromley (Description to appear in American Museum Novitates). The first Ohio record of this species of the Missouri and Mississippi River Valleys, was collected in a field in which weeds had recently been cut at the edge of a vegetable garden in a corner lot, at Erie and Raymar Streets in Hyde Park, on August 11, 1947, by R. M. Goslin and S. W. Bromley. On August 17, 1949, Dr. E. S. Thomas, S. W. Bromley and R. M. Goslin went back to this place. Another specimen, a female (the preceding being a male) was collected by R. M. Goslin at the very spot where the 1947 one was found.

2. Change of Name

The numbers preceding the following data are those used in my original listing.

24. **Laphystia ochreifrons** Curran. In my original list of Ohio Asilids in Ohio State Museum Bulletin, vol. 1, No. 2, 1931, page 8, *Laphystia notata* Bigot was recorded from Cincinnati in both the J. S. Hine and the Charles Dury collections. This name should be changed to *Laphystia ochreifrons* Curran. One of Curran's types was from "Ohio." *Notata* does not seem to occur east of the Mississippi.

3. Unusual Records of Species Not New to Ohio

26. **Atomosia glabrata** Say. Resembles superficially *A. puella* Wiedemann, but has more yellow on the legs, the undersides of the front femora being entirely yellow. It rests on leaves and plant stalks. 5 specimens were collected in Jackson Twp., Vinton County, August 19, 1941, by R. M. Goslin. At Roseville, August 13, 1949, one was noted, but not collected, resting on the stem of a tall Joe Pye weed. At Hyde Park, on August 17, 1949, one was collected by R. M. Goslin on a corn stalk. Mr. Goslin also saw one in the same cornfield on August 18, 1949, where it was resting on a leaf-blade of corn with a white fly in its grasp. Two specimens were collected by R. M. Goslin at "Neotoma," Hocking Co., on August 16, 1942.

Atomosia glabrata, Neotoma, Goodhope Twp., Hocking County, Ohio, Aug. 16, 1942, 1, R. M. Goslin.

Atomosia glabrata, Vinton County, Ohio, Jackson Twp., S 25, Aug. 19, 1941, 1, R. M. Goslin.

Atomosia glabrata, in the Ohio State Museum Collection.

Neotoma, Goodhope Twp., Hocking County, Ohio, Aug. 16, 1942, 1, R. M. Goslin.
Vinton County, Jackson Twp., Ohio, S 25, Aug. 19, 1941, 4, R. M. Goslin
Cincinnati, Ohio, Hyde Park, Aug. 17, 1949, 1, R. M. Goslin.

38. **Bombomima thoracica** Fabricius. Dr. J. N. Knull collected a female with a 17-year cicada as prey at Clifton, June 5, 1936. The cicada was of the smaller variety, *Magicicada septendecim* (L.) var. *cassinii* (Fisher). This is my only record of an asilid attacking the 17-year locust, although the dragon fly, *Epiaeschna heros*, and the introduced ground beetle, *Calosoma sycophanta*, are known to prey on this cicada.

40. **Dasylechia atrox** Williston. Dr. J. N. Knull, Curator of the Ohio State University Insect Collection, discovered a female of this rare species in one of the student collections in 1948 without label but presumably collected that summer on or near the Ohio State University campus. Another in a student collection in 1949 was labelled Sharon, Ohio, June 7, 1949.

42. **Mallophora orcina** Wiedeman. **The Southern Bee-killer.** This species was recorded from Madison Township, Guernsey County, in late summer, 1915, by Thomas Guyton in his unpublished Master's thesis "Insects of an Ohio Farm" (O. S. U. 1916), on p. 119 of the 149 page typed manuscript. This is the northernmost record of the species. It was collected abundantly at Hyde Park, near Cincinnati, in 1899 by Charles Dury. A series was collected by E. S. Thomas, R. M. Goslin and S. W. Bromley at Perry, Gallia County, in a Joe Pye weed swale on August 27, 1938, and in a sandy bean field in Harrison Township, Scioto County, on August 28, 1938. In the University collection in the Botany and Zoology Building O. S. U. are 2 specimens collected by R. W. Strandtmann on August 8, 1942, in Lawrence County, and 2 more on August 9, 1942, in Jackson County.

44. **Promachus hinei** Bromley. New localities are: Numerous specimens collected by Homer F. Price of Payne, Ohio, in Paulding and Defiance Counties, between July 31 and Sept. 26, where Mr. Price reports the species to be common. Defiance County, July 31, 1942; and Blue Creek, Paulding County, August 2, 1942; Clifton Gorge, August 13, 1948 (J. N. Knull and S. W. Bromley); Roseville, August 13, 1949 (S. W. Bromley) and a series collected by E. S. Thomas, R. M. Goslin, S. W. Bromley and Ralph Dury at Linwood and Hyde Park mostly in cornfields and surrounding rank vegetation on August 17 and 18, 1949; Ross County, Andersonville, August 17, 1941, R. M. Goslin; Adams County, Monroe Twp., August 14, 1938, Edward S. Thomas and John S. Thomas; and Adams County, Meigs Twp., August 16, 1947, Wm. E. Goslin.

45. **Promachus rufipes** Fabricius. Mr. Robert M. Goslin, in rearranging the exhibit collection at the Ohio State Museum found a series of this species that the late Professor J. S. Hine had collected in Lawrence County, August 18, 1929. There were one male and three females in the series. *Rufipes* is restricted to the extreme southeastern counties in Ohio. In certain parts of the "deep South," *rufipes* is called the "Bee Panther" because of its attacks on the domestic bee. The most northern record of its capture is Hudson, New York, where I collected it in August, 1924.

68. **Mallophora clausicella** Macquart. Abundant at "Neotoma," Hocking County, on August 28, 1943, where collections were made by S. W. Bromley and R. M. Goslin. They were noted flying actively about within 6 inches of the ground, alighting on Andropogon and other weed stalks. One was noted preying on a halictid bee. A female was noted laying a white froth-covered packet of eggs

on the tip of a grass head in a footpath. A mating pair was noted. In flight, these flies carried the tip of the abdomen upturned.

82. **Leptogaster tenuipes** Loew. A total of 14 specimens[1] of this rare Ohio species has now been collected by Robert M. Goslin, 13 along Alum Creek, Columbus, and 1 in Berne Twp., Fairfield Co. The dates range between July 22 and September 6.

4. Zoomimesis

All through the larger Diptera we find species of flies mimicking the well-defended aculeate Hymenoptera with which they are locally associated. In Ohio there are several robber flies which are mimics of common native bees and wasps. Here are the 12 outstanding mimics listed with the degree of mimicry exhibited and the name of the model:

13. **Ceraturgus cruciatus.** Fair mimic of queen yellow jacket, *Vespa maculifrons* or *Vespa arenaria.*

84. **Ceraturgus dimidiatus.** Fair of queen hornet, *Vespa maculata.*

91. **Ceraturgus aurulentus.** Fair of worker yellow jacket, *Vespa maculifrons* or *V. arenaria.*

19. **Diogmites discolor.** Poor of brown wasp, *Polistes fuscatus.*

40. **Dasylechia atrox.** Good of carpenter bee, *Xylocopa virginica.*

38. **Bombomima thoracica.** Excellent of bumblebee, *Bombus impatiens* or *B. vagans.*

37. **Bombomima grossa.** Poor of large bumblebee. O. E. Plath considered *grossa* mimetic of the guest bumblebee, *Psythirus laboriosus* Fabr.

36. **Bombomima flavicollis.** Good of sand bee, *Andrena carlini* Ckll.

35. **Bombomima divisor.** Poor of hornet, *Vespa maculata.*

39. **Bombomima virginica.** Good of worker bumblebee, *Bombus impatiens.*

68. **Mallophora clausicella.** Fair of bee, *Megachile latimanus* Say.

42. **Mallophora orcina.** Fair of worker bumblebee, *Bombus americanorum.*

5. Honeybee Prey Records

21. **Diogmites neoternatus** Bromley. Through an oversight, this species was not listed among the asilids preying on Ohio honeybees in my last paper, Ohio Robber Flies IV, Ohio Journal of Science 67, 2, March, 1947, p. 68. I have 3 Ohio records of this species with honeybee prey: one, Roseville, August 3, 1941, and two, Montgomery, near Cincinnati, August 11, 1947, (S. W. Bromley and R. M. Goslin). This long-legged scraggly species, characterized by the clavate abdomen

[1] *Leptogaster tenuipes*
In Ohio State Museum:
Columbus, Ohio, Alum Creek—July 22, 1944—2
" " " " Aug. 7, 1943—1
" " " " Aug. 14, 1943—2
" " " " Aug. 19, 1942—1
" " " " Aug. 22, 1944—1
" " " " July 30, 1949—1
Fairfield Co., Ohio, Berne Twp., S 9—September 6, 1943—1
Leptogaster tenuipes
In R. M. Goslin Collection:
Columbus, Ohio, Alum Creek—Aug. 14, 1943—1
" " " " July 29, 1944—1
Leptogaster tenuipes
To Dr. Stanley W. Bromley Collection:
Columbus, Ohio, Alum Creek—Aug. 13, 1946—1
" " " " Aug. 27, 1946—1
Leptogaster tenuipes
To the Ohio State University Collection:
Columbus, Ohio, Alum Creek—Aug. 28, 1947—1
All of the above specimens collected by Robert M. Goslin.

which is entirely pale reddish-yellow without black markings, and the three deep black velvety stripes on the mesonotum, the middle of which fades into red anteriorly, is a ghostly appearing robber fly, flying silently with outstretched legs in a manner reminiscent of the Phantom Crane fly, *Bittacomorpha clavipes*. The large dark eyes stare at one as the fly hovers nearby. This *Diogmites* has the peculiar habit of flying, when disturbed, directly *through* a shrub or weed, rather than over or around it. It feeds largely on bees and wasps, frequently catching honeybees and *Polistes* wasps.

22. **Diogmites umbrinus** Loew. **The New York Bee-Killer.** This species occurs locally throughout the state but is most frequently found in the Ohio River Valley. An amateur entomologist who kept bees for many years in New York State once told me that he thought this robber fly, together with the Nebraska Bee-Killer, *Promachus fitchii*, had caused economic losses to bee keepers there, and furthermore said that he believed these 2 species largely responsible for the statement made on page 142 of Howard's Insect Book, that Dr. Fitch's correspondent had claimed that "it was through the work of robber flies that during certain seasons in a bee-raising region in New York not a single hive threw off a swarm." P. fitchii's season was late June and July with *umbrinus* taking over in August and September. I have never heard of this species causing such losses in Ohio. The Nebraska Bee-killer, of course, has never been recorded from Ohio, which is probably due to the fact that it requires a certain type of soil, lacking here.

In August, 1930, Dr. Kellogg, then Professor of Bee-keeping at the Massachusetts Agricultural College, Amherst, Mass., found *D. umbrinus* killing honeybees in numbers at the College Apiary. In writing of this species, I am reminded of an interesting item told me by my great friend, the late C. W. Johnson. In 1913, a colony of the wasp, *Aphilanthops frigidus*, was harassed in Massachusetts by *D. umbrinus*. This robber fly was seen seizing not only the wasps alone but also when carrying their own prey of winged female ants.

I might add that *umbrinus*, once the most abundant of the larger asilids in New York and New England, has become increasingly scarce during the past 50 years. It formerly occurred within the limits of New York City, Angus having collected it preying on honeybees at West Farms years ago, but now it has disappeared from most if not all of Westchester County. Long before this species was scientifically described, it was pictured in Dr. E. Emmons' "Natural History of New York" (1854) plate 28, Fig. 2 labelled "undescribed." This red robber fly was abundant in South Central Massachusetts during my boyhood and was even noted flying in the streets of Southbridge, where it was common in flower and vegetable gardens. It was the first robber fly to engage my attention when I found it capturing yellow jackets near their nests, thereby endearing itself to me in my childhood fight against the common enemy.

I have obtained additional Ohio honeybee prey records from the following:

42. **Mallophora orcina,** 50 plus (George E. Perry, Newtown). Mr. Perry told me on August 18, 1949, that he had seen more than 50 bees captured by this "Bee Hawk" during the past few years. They fly singly about the hives and catch the bees on the wing, sometimes close to the entrances. Frequently this audacity amounts to suicide. The bees, enraged by the killing of one of their number, attack the robber fly en masse and sting it to death. Strong colonies of bees, according to Mr. Perry, will not tolerate the presence of this fly close to the hive. He has found the dead bodies of *orcina* at hive entrances on a number of occasions—mute testimony of the bees' deadly retribution.

43. **Promachus vertebratus,** 22. 17 near or at Columbus (SWB) plus 5 at Alum Creek, Columbus (RMG).

44. **Promachus hinei,** 18. 5, Defiance and Paulding Counties (Homer F. Price). 5, Roseville (SWB). 8, Cincinnati (Ralph Dury, R. M. Goslin, S. W. Bromley).

38. **Bombomima thoracica,** 14. Columbus (R. M. Goslin).

19. **Diogmites discolor,** 14. Columbus (R. M. Goslin). Cincinnati (G. E. Perry and McClure) (R. M. Goslin and S. W. Bromley). On August 17, 1949, at Newtown, Mr. McClure found a large male dead at hive entrance after it had caught a bee and was mobbed and stung by the swarm.

22. **Diogmites umbrinus,** 10. 6, Lancaster (SWB). 4, Cincinnati (RMG and Ralph Dury).

This brings the total honeybee prey records for Ohio Bee-killing Asilids to the following tabulation of the 6 outstanding bee-killers.

Name of Asilid	*Number of honey-bee prey*
Mallophora orcina	71
Promachus vertebratus	50
Diogmites discolor	31
Promachus hinei	26
Bombomima thoracica	23
Diogmites umbrinus	19

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CONFERENCE ON THE SCIENTIFIC METHOD

Roosevelt College and the Philosophy of Science Association will conduct a two-day conference on "What is the Scientific Method?" at Roosevelt College in Chicago on Friday and Saturday, October 20 and 21, 1950. Principal speakers will be Professors Sebastian Littauer, Columbia University; Nicholas Rashevsky, University of Chicago; Howard Becker, University of Wisconsin; and Thomas Cowan, Wayne University.

For further information, please write either to Professor Morris Goran, Roosevelt College, 430 S. Michigan Avenue, Chicago 5, Illinois, or Professor Russell L. Ackoff, Wayne University, Detroit 1, Michigan.

CHLADNIAN MOVEMENT IN THE WOOD OF VIOLINS

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In a program to discover the "lost art" of the old Italian violin-makers Stradivari, the Guarneri, the Amati, etc., the writer (1) recently proposed the use of raw linseed oil for the preliminary treatment of the wood of the violins while the completed instruments are in the condition known as "in the white," that is, before the varnish has been applied. This simple application of linseed oil to the wood produced a number of desirable advantages, which suggest that it might have been used by the old Italian masters. An additional effect has now been found that was not anticipated originally, which may have pronounced influence on the tonal properties of the wood.

THEORETICAL CONSIDERATIONS

It is known (2, 3) that raw linseed oil upon oxidation over a period of years first passes through the rubbery or linoxyn stage and then finally becomes soft, sticky and "balsamic" in character. Although this ultimate degradation or oxidation product is extremely viscous, it will exhibit slow-flow. For this reason it was considered desirable to determine if a liquid could be forced to move *inside* wooden plates if the plates impregnated with the liquid were set in vibration. If this movement did occur, it would also be desirable to determine if the liquid appeared in higher concentrations at certain areas of the vibrating plates. This behavior of the liquid particles inside wooden plates would then be analagous to that of the grains of sand on the surface of Chladni plates. The change of position of free particles *in* or *on* vibrating plates to nodal areas may then be called Chladnian movement.

A number of devices were considered to determine if a liquid inside wooden plates would respond to movement to nodal areas when the plates were set in vibration. All were abandoned in favor of actual experiments on a violin "in the white." The top and the back of a violin are vibratable plates and as such should display modes of vibration and nodal areas. Although these plates are very complex systems because of their unique shape, the presence of longitudinal and lateral arches and the varying thicknesses (graduations), they should nevertheless exhibit some Chladnian effects when subjected to vibration. That these effects are produced may be readily demonstrated by placing a suitable small object on the back of a violin and plucking or bowing a string, whereupon the object will dance. But because of the shape and curvature of the plates of a violin, a permanent pattern cannot be obtained on the surface. However, if the wood of a violin were impregnated with a liquid, then a pattern might be obtained as the result of Chladnian movement when the violin is played.

EXPERIMENTAL DATA

As linseed oil is subject to oxidation which would introduce complications especially if the experiments were extended over periods of time, it was decided to use an inert mineral oil; Squibb's medicinal mineral oil was found satisfactory for the purpose. So that any movement of the oil in and on the wood might be observed more readily, the mineral oil was colored red by alizarine-zinc-rosinate (1).

IMPREGNATING OIL

Squibb's Mineral Oil, medicinal grade	50.0 gms.
Alizarine-zinc-rosinate	3.0 gms.

This mixture was applied with a brush to the exterior of a violin "in the white" until further absorption became slow. A large excess of oil was deliberately used so that if movement under vibration (actual playing) did occur, sufficient oil would be re-located to appear on the surface of the wood. At the beginning of each experiment the violin was wiped thoroughly to be certain that all superficial oil was removed; the surface of the wood was "dry." The violin was then played steadily for fifteen minutes each time in the normal manner and using violin music. This method of placing the plates in vibration was considered preferable to that of using only open strings or one tone because it precisely represents actual playing conditions. The following results were observed:

(a) Oil in shiny "wet" patches appeared on the surface of the back of the violin, but not on the top nor on the sides.

(b) The oil-areas on the back, although not well defined, appeared in the same locations after repeated experiments which are illustrated in Figure 1.

FIG. 1. Location of oil areas on back of violin.

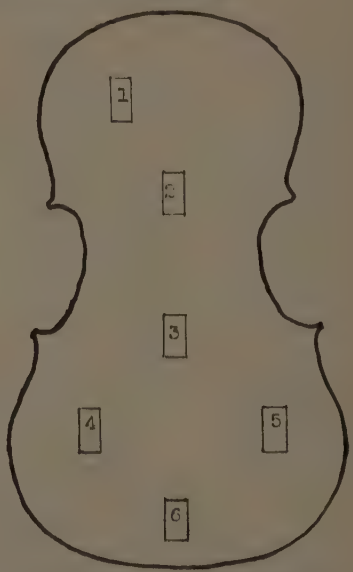

FIG. 2. Location of specimens taken for oil analyses.

(c) The oil patches disappeared from the surface of the back and were reabsorbed by the wood within several hours after the first experimental playings.

(d) The oil-areas gradually failed to appear on the surface of the back upon playing the violin, and after about five days, the oil patches did not appear. Additional applications of oil caused the oil-areas to appear again; but these too gradually failed to appear after four or five days. A total of four applications of oil were made extending over a period of eighteen months, and in each instance oil areas appeared upon playing the violin, to a decreasing extent, for a few days and then failed to appear after four or five days.

ANALYTICAL DETERMINATIONS

In order to investigate this behavior of the oil further, analyses were made of specimens of the wood cut from various locations on the top and on the back. The specimens were one inch by two inches in size, and the locations are indicated on Fig. 2. Specimens No. 1 and No. 2 were cut from the back immediately after

playing the violin for the last time with the thought that the oil would not have an opportunity to return to a more uniform distribution in the wood. The other specimens were cut thirty-six hours later with the thought that the oil would have had an opportunity to redistribute itself after the wood was subjected to vibration.

When the violin was opened, preparatory to sawing test specimens from various sections, "reddish areas" were visible on the inside of the back corresponding to the oil patches on the outside. The colored area corresponding to back Specimen No. 5 was well pronounced. This would indicate that the oil patches appeared on the inside of the plate also, but to a lesser extent than on the outside. The center portion of the back on the inside was yellowish. The inside of the front of the violin was deeply colored around the ff holes, the colored area extending several inches above and below the openings. The inside center of the top was light yellow. The side bouts were generally reddish.

The specimens were extracted with benzene in a Soxhlet extraction apparatus, air dried to remove residual solvent, and then dried in an oven for eight hours at 105° C. The weighings were made at once, and the percentage of benzene soluble matter was referred to the oven dried weight. The results are summarized in Table I.

TABLE I

DISTRIBUTION OF OIL IN THE WOOD

Specimen	*Location*	*Benzene Extractable*
No. 1	Back	11.7%
2	Back	12.2%
3	Back	10.3%
3	Top	12.3%
4	Back	10.6%
4	Top	13.4%
5	Back	9.8%
6	Back	11.7%
6	Top	13.7%

INTERPRETATION OF RESULTS

Those areas on the back of the violin initially showing increased oil concentration, as the result of vibration, would at first thought be presumed to be nodal areas. It would be reasonable to assume that the oil particles, like particles of sand on a vibrating Chladni plate, had been moved by vibration of the violin plate to these areas. However, these portions of a violin back are the freest to vibrate being away from the node at the sound-post and from the sides of the violin to which the plate is attached. These areas would normally be considered antinodes. Moreover, the oil patches appeared upon playing the violin only for a short time after an application of the oil. Since the plate as a whole has not apparently lost its property to vibrate, then some other component, which loses some of its property to vibrate relatively quickly, is responsible for the movement of the oil for a short time.

This anomalous behavior may be explained by the concept that in a vibrating wooden plate, there may be two components in motion: the plate as a whole and the internal cellular structure of the wood. Vibration of the cell walls would then be more intense in areas where the vibration of the whole plate is constrained, and vice versa. For example, the node of the back plate at the foot of the sound post would then be an area of maximum vibration of the cell walls of the wood. The four areas indicated on Fig. 1 where the violin plate is freest to vibrate would then be areas of minimum excitation of the cellular structure. The oil patches observed were accordingly areas of least internal vibration ("nodal areas" with reference to the cell walls) and the oil concentrated in these areas in consequence. After the oil had thoroughly permeated the cellular structure of the wood, its ability to respond to vibration was reduced (damping effect) and the movement of the oil when the violin was played no longer occurred.

This theory would also account for the pronounced red areas on the inside of the top plate around the ff holes. This portion of the top is freest to vibrate bodily resulting in less internal motion in the cell walls, which would cause a movement of the oil to these areas. The absence of oil patches on the top plate may be due to the fact that the character of the wood (soft wood, spruce) and the manner in which it is cut for violin making are not conducive to the migration of the oil when the plate is vibrated.

The analytical data reveal that the oil eventually becomes distributed relatively uniformly in the wood irrespective of the original appearance of concentrated oil patches. These analyses also indicate that any gravitational flow of oil will not account for the presence of oil patches on the back and the absence of oil spots on the top and the sides. The experimental violin with its average content of over 11% oil was hung by its scroll in an *upright* position for a year and one-half, which included two summers (hot weather). If any gravitational flow of oil had occurred it would have been observed; and the difference in the oil contents of Specimen No. 1 cut from the upper portion of the back and of Specimen No. 6 cut from the lower portion of the back would have been appreciable. The percentage content of oil in both specimens was the same. Apparently the wood is capable of "holding" the oil so that vibration (after a preliminary period) and gravity cannot dislodge it.

The effect of vibration on the wood of violins, especially on its internal structure, has received very little attention from previous investigators. Moreover, the realization is growing that the old Italian masters subjected the wood of their instruments to some preliminary treatment which could account for the consistent superiority of their instruments. Wood is a natural product the growth of which cannot be controlled or influenced; moreover, wood is far from being a homogeneous material. This fact would also suggest the need of some processing of the wood to render it more uniform and more suitable for a use in which its ability to vibrate properly is of prime importance.

Nicholas (4) as the result of X-ray studies of the wood of an old Italian violin has stated that the only possible explanation of the difference between the diffraction rings obtained from a new violin and those from a Guarneri fiddle is that the wood in the latter has been subjected to some special treatment which tends to alter the cellulose structure. Fry (5) has reported that the violin finished and not varnished has more power and mellowness in its tone but if it remains in this virgin state, it becomes modified little by little, and after a somewhat short time, the tone becomes poor and feeble. A better understanding of the effect of vibration on wood and variously treated wood will supply much needed information on this aspect of the Science of Violin-Making. For example, a preliminary treatment that dampens secondary vibrations inside the wood and permits the primary bodily vibrations of the violin plates to prevail to an increasing extent should improve the acoustical properties of the wood.

SUMMARY

The Chladnian movement initially observed in an oil-impregnated violin plate may be due to the vibrations inside the wood, that is, in its cellular structure. The distribution of the oil in the wood eventually becomes relatively uniform and is not affected by gravity or vibration.

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A NEW GENUS EUPTERELLA AND FIVE NEW SPECIES OF LEAFHOPPERS RELATED TO CICADELLA

(Homoptera—Cicadellidae)

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In the study of the leafhopper fauna of Mexico a number of specimens were found in pine forest at altitudes varying from 5000 feet to 10,000 feet which are similar in appearance and structure. These apparently belong to an undescribed genus and five species have been distinguished in the material at hand.

Genus **Eupterella** n. gen.

Related to *Cicadella*. The vertex is produced and bluntly or sharply angled. The head is distinctly narrower than the pronotum. The elytra with the second apical cell triangular and stalked. The third and fourth apical cells formed by a vein which arises on the medius behind the cross nervures but before it forks to form the second apical and which extends to the posterior margin of the elytron. Hind wing with four veins forming three open apical cells. The radius and medius are connected with a cross vein but remain separated. The male aedeagus is composed of a basal transverse portion which is bent abruptly back upon itself and produced into an erect whip-like terminal portion.

Genotype: *Eupterella mexicana* n. sp.

Eupteryx huachucae Lawson is apparently congeneric with this material.

Eupterella mexicana n. sp.

In general appearance resembling a species of *Cicadella* but with distinct genitalia. Length 3.5–3.8 mm.

Vertex produced, bluntly angled, median length three-fourths as great as the basal width between the eyes. Head including eyes much narrower than pronotum and about half as long as pronotum.

Color: Vertex creamy with a pair of elongate, diagonal, black spots extending from apex toward eyes just above margin. The portion next the eye is broadened. Pronotum creamy with six dark spots. There is a pair on the anterior margin, one on each side just posterior to the outer portion of the vertex at its base. There is a pair on the outer portion of the disc, more widely separated than the anterior pair. Also a spot on the outer margin of pronotum, each side, just posterior to the outer margin of the eye. Scutellum creamy, the basal angles orange to reddish. Elytra pale, flecked and mottled with reddish pigment. There is an elongated reddish spot on the costal margin just before the anterior apical nervure. Veins on apical portion pale, margined with brown. Face pale in female, infuscated in male with a large black spot just beneath the eye and a transverse black spot next each eye on face.

Genitalia: Female seventh sternite long, the posterior margin slightly concavely sloping to a broad produced lobe-like apex which is keeled at middle. Male plates broad and elongate, convexly rounded, abruptly narrowed near apex with narrow, blunt, upturned apices. Styles narrow, elongate; apical portion is foot-like in appearance with the sharpened toe-like portion directed outwardly. The aedeagus in lateral view is transverse at base. It is then bent back upon itself downward, then upward to form a long, slender apical whip. This portion is decidedly broadened after being curved back and as it crosses aedeagus shaft.

Holotype male collected at Carapan, Mich., Mexico, October 2, 1941. Allotype female from Laguna de Zempoala, Mor., October 21, 1945; male and female paratypes from Carapan, same date, Laguna de Zempoala, same date, Tres Cumbres, D. F., October 21, 1941, Desierto de los Leones, D. F., July 11, 1927, and August 1, 1932, and the state border between Mexico and Mich., K-139, September 28, 1945. The 1941 material was collected by Caldwell, Good, Plummer and DeLong, and the 1945 material by Plummer, DeLong, Hershberger and Elliott.

Eupterella frigida n. sp.

Resembling *mexicana* in general form and appearance but with head blunter and with distinct male genital structures. Length 3.5–3.8 mm.

Vertex produced, bluntly angled, median length about half the basal width between the eyes, longer at middle than next the eyes, less than half as long as pronotum.

Color: Quite variable. Vertex usually some shade of yellow with a pair of black, transverse, diagonal spots just above apex and extending toward eyes. Pronotum yellow to reddish brown. When sufficiently pale, with a pair of black spots on anterior portion, one just posterior to inner margin of each eye, and a pair on posterior portion of disc which are more widely separated. A third pair of spots are on the outer margins of the pronotum, one just posterior to the outer margin of each eye. Scutellum pale to brownish. Elytra variously marked, usually mottled. Posterior portion usually dark or smoky, especially the margins of the veins. Face in female usually pale with a dark transverse spot above each antenna and between eyes. In male the face is usually dark brown to black, often reaching spots above and leaving a white band just beneath vertex margin.

Genitalia: Female seventh sternite with short lateral angles, posterior margin sloping to a well-produced, bluntly angled apex. Male plates and styles as in *mexicana*. The aedeagus in lateral view has a more expanded aedeagus shaft with shorter and more approximate dorsal spine-like processes. Also, the portion crossing the shaft after curving is narrow, not expanded as in *mexicana*. In ventro-caudal view the apical portion is broadened then tapered to a pointed apex.

Holotype male collected at Rio Frio, D.F., Mexico, October 18, 1941. Allotype female and paratype females were collected at the same locality October 7, 1941. Paratype females also collected October 18, 1941. All of these were taken by DeLong, Good, Plummer and Caldwell and female paratypes taken at the same locality October 10, 1945, by DeLong, Hershberger and Elliott.

Eupterella acuminata n. sp.

Resembling *mexicana* in general form but smaller in size with a more produced head and with distinct genitalia. Length 3 mm.

Vertex rather pointed, angularly produced, median length about two-thirds the basal width between the eyes, a little blunter in the male.

Color: Pale yellow marked with black, brown and red. Vertex usually tinted with bright red on basal two-thirds. Apex with a black line, sometimes quite broad, extending toward eye on either side. Pronotum pale tinged with red and yellow, with two separated black spots just back of margin. Scutellum yellowish, the basal angles brown or black. Elytra pale with broad and reddish markings. Anterior portion mottled with brown, corium and posterior half of clavus with reddish or brownish dots. The posterior costal area reddish and smoky, veins pale. Face pale unmarked in both sexes.

Genitalia: Female seventh sternite with long lateral margins from which the posterior margin is strongly concavely produced to form a median lobe which is about as long and half as wide as basal portion and is rounded at apex. Male plates and styles similar to *mexicana*. The aedeagus is expanded on the shaft and the apical whip-like portion is slender as viewed both from the lateral and ventral views.

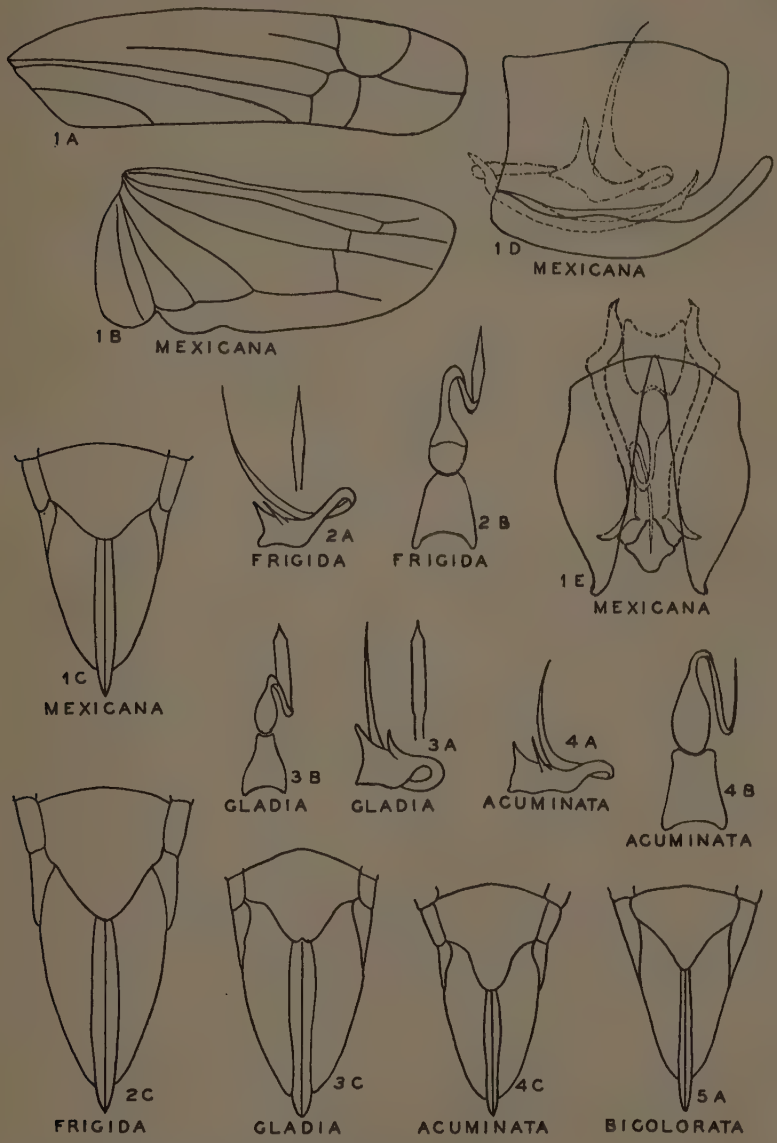
Holotype male, allotype female and paratype male collected at Orizaba, Veracruz, Mexico, October 17, 1941, by Plummer, Caldwell, Good and DeLong. A female paratype was taken at Tehuacan, Pue., on the same day by the same collectors and a male paratype at Saltillo, Coah., Mexico, September 23, 1941, by Good, Caldwell and DeLong.

Eupterella gladia n. sp.

Resembling *frigida* in form and general appearance with blunt vertex and distinct male genitalia. Length 3.5–3.7 mm.

Vertex short, almost rounded in male, median length three-fourths as great as the basal width between the eyes in female and more than one-half as long in the male.

Color: Somewhat variable, female usually paler than male. The vertex in the male is yellow with the elongate spots at apex fused to form a transverse band. Pronotum with the four spots on anterior portion conspicuous. The two on the posterior portion of disc are fused



Illustrations of species of *Eupterella* as labeled:

1. *E. mexicana*—(1a.) forewing; (1b.) hind wing; (1c.) ventral view of apical portion of female abdomen; (1d.) lateral view and (1e.) ventral view of male genital structures.
2. *E. frigida*—(2a.) lateral view and (2b.) ventro-caudal view of male aedeagus; (2c.) ventral view of apical portion of female abdomen.
3. *E. gladia*—(3a.) lateral view and (3b.) ventro-caudal view of male aedeagus; (3c.) ventral view of apical portion of female abdomen.
4. *E. acuminata*—(4a.) lateral view and (4b.) ventral view of male aedeagus; (4c.) ventral view of apical portion of female abdomen.
5. *E. bicolorata*—(5a.) ventral view of female abdomen.

with a transverse dark brown band which extends almost across the posterior margin of the pronotum and is widened at middle. Scutellum with anterior half dark brown, posterior half pale. Elytra with a brown area in the basal claval area and a diagonal brownish area extending from costa to posterior half of clavus. Veins on posterior portion pale bordered with brown. Face in male pale brownish with the large spots below the eyes and the transverse spots between eyes on face conspicuous.

Genitalia: Female seventh sternite rather long, the posterior margin rather definitely concavely excavated each side of a produced median lobe which is about half as wide as the basal width. Male plates and styles similar to those of *mexicana*. Aedeagus shaft broadened. The anterior dorsal spine like process is conspicuous. The apical portion of the aedeagus whip structure is quite broadened to near its apex where it is rather abruptly narrowed to a pointed apex, appearing sword-like.

Male holotype from Mexico City, September 2, 1937, by Dampf. Allotype female from State Border of Mexico and Mich. collected September 28, 1945, by Plummer, DeLong, Hershberger and Elliott. Male paratypes from Rio Frio, D. F., October 10, 1945, by DeLong, Hershberger and Elliott and male paratypes from Santa Rosa, D. F., Mexico, July 24, 1932, by Dampf. A series of female paratypes referred to this species were taken at Mexico City September 2, 1937, by Dr. Dampf.

Eupterella gladia var. **limba** n. sp.

Resembling *gladia* in general form and appearance but with different coloration. Length 3.5 mm.

Color: Vertex yellow, broadly bordered with black along margin from apex to base of eyes. Pronotum marked with dark brown or black so as to show only a yellowish area on the disc and a faint yellowish border on the posterior margin. Scutellum with the anterior half black, the posterior half yellow. Elytra rather heavily marked with brown. Light areas are on the anterior portion and the apical portion of clavus. Veins on anterior half of elytra inconspicuous. On the posterior half they are pale, dark margined. Face in both sexes black with a white transverse band just beneath margin of vertex. Antennae and legs bright yellow.

Genitalia: Female last ventral segment with long lateral margins, the posterior margin sloping and produced to form a median rounded lobe more than half as broad as basal portion of segment. Male genital structures similar to those of *gladia*.

Holotype male collected at Tres Cumbres, D. F., October 21, 1941, and female allotype from Carapan, Mich., October 2, 1941, by DeLong, Plummer, Good and Caldwell. Paratype male from Desierto de los Leones, D. F., November 5, 1933, by Plummer.

Eupterella gladia var. **bifasciata** n. sp.

In general appearance resembling var. *limba* but with different colorations. Length 3 mm.

Vertex well produced, blunt at apex, median length about two-thirds the basal width between eyes.

Color: Vertex black except a transverse white spot at base. Pronotum black, a pair of proximal pale spots on disc and central half of posterior margin white bordered. Scutellum white with the basal and apical angles black. Basal half of elytra black except a small spot on inner margin of each clavus at apex of scutellum and an elongate spot on middle of each costa. Posterior half pale with veins broadly margined with brown. Apical cells smoky. Face white with a heavy black transverse band across face between eyes forming a white band between this and margin of vertex.

Genitalia: Female segment produced and blunt at apex as in *gladia*.

Holotype female from Tuxtla, Gutierrez, Mexico, June 4, 1926, collected by Dr. Dampf.

Eupterella bicolorata n. sp.

Resembling *mexicana* in general form but with distinct coloration. Female only. Length 3 mm.

Vertex rather strongly produced and bluntly angled.

Color: Vertex white with a narrow black border extending along each side from apex to eyes. Pronotum white bordered with black along anterior margin and rather broadly along the lateral margins of the pronotum. Scutellum white, the basal angles with small black spots.

Elytra marked with the same sharp definition of color. The clavus entirely yellow except a small black spot on anterior basal angle. Remainder of elytra predominantly black. An elongate spot on central portion of costa and inner portions of antepical cells pale. The veins on apical third are pale, widely bordered with brown. Apical portion smoky.

Genitalia: Female seventh sternite rather long, posterior margin strongly produced and sloping on each side to form a produced bluntly rounded median lobe.

This unique female is described because of its distinctive and contrasting color pattern in spite of the fact no male specimen is available.

Female holotype collected at Zitacuaro, Mich., Mexico, September 29, 1941, (Km. 160) by DeLong, Good, Caldwell and Plummer.

PLANKTON POPULATION OF CERTAIN LAKES AND STREAMS IN THE ROCKY MOUNTAIN NATIONAL PARK, COLORADO

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An extensive survey of the plankton population of the streams in the Ohio River watershed was made from 1939 1942 (Brinley and Katzin, 1944). This study revealed the fact that the northern tributaries of the Ohio River support a much larger phytoplankton population in species and numbers than the southern tributaries. This difference in plankton distribution is attributed to the fact that the northern streams flow through densely populated areas, the farm lands are fertile and the surface waters are generally polluted with human and industrial wastes. The southern streams, on the other hand, pass through sparsely populated regions where the soils are poor and the streams are less likely to be enriched with organic pollution. The algae population seems to be directly correlated with the amount of decomposed organic matter in the stream. Studies of the White (Brinley, 1942a) and the Cumberland Rivers (Brinley, 1942b) clearly showed that isolated sources of heavy organic pollution greatly increased the growth of algae, in numbers and species, in the stream below the entrance of the sewage.

It is desirous to obtain more information on the relation of stream fertility to the plankton population by studying streams which are free from organic pollution. Such streams do not exist in the state of Ohio so it seemed advisable to study the problem in sparsely populated mountain districts where the streams are free from human wastes and where the decomposition of natural organic matter, vegetation, leaves, humus, etc., is at a minimum.

Permission was freely given by the National Park Service to conduct these studies in the Rocky Mountain National Park. The writer wishes to express his appreciation to David Canfield, Superintendent, J. Barton Herschler, Chief Ranger, and Edwin C. Alberts, Park Naturalist, for all facilities of the Park which were so graciously given.

METHODS AND PROCEDURE

The present studies were made in the Park from June 13 to July 22, 1949. In the beginning of the study, samples of water were collected in wide mouth bottles and an attempt was made to make qualitative and quantitative determinations of the population of plankton and to express the quantitative results in parts per million as recorded in the previous publications (Brinley, 1942). However, it was soon found that the plankton population of these streams and lakes was so low

that collections of small samples yielded very few individuals and the volume was less than one part per million as compared with several parts per million as found in the Ohio River Basin. It was decided, therefore, to discontinue the small sample collections and to use a plankton net. Approximately ten to twenty gallons of water were filtered through the net by sweeping the net through quiet water or allowing running water to flow through the net. The fifteen milliliters of catch were then concentrated to one ml. by centrifuging. This method was largely qualitative and thus no volume determinations were made. The lake samples were taken from the shore line on the leeward side of the lake. Samples from the streams were largely taken from boulders along the shore by allowing the water to flow through the net.

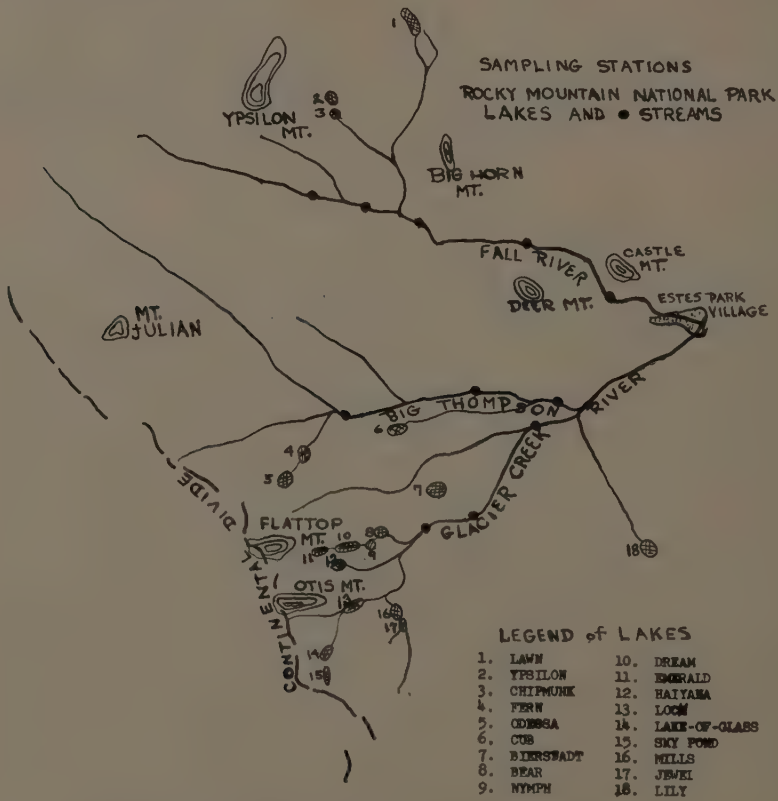

FIG. 1. Map of the area from which collections were made.

The stream beds and lakes in the Park were glacier formed and thereby in many cases two to four lakes are terraced up the gorges and during high water these lakes are connected by a flowing stream. The lakes studied were conveniently arranged in related groups as they occur in the common valley (see map tracing). In most cases the lakes had stony bottoms and were partly filled with loose boulders that had descended from rocky ledges above. The rocks along the shore line were covered with unidentified filamentous algae and a layer of silt of various depths covered the bottom between the rocks and boulders. During the

month of June, snow banks extended to the edge of the water in most of the lakes of high elevations.

The typical mountain streams flowed over rocky valley floors and during high water in June the samples collected contained large amounts of sand which seriously interferred with the plankton determinations. Unidentified filamentous algae covered the rocks.

DISTRIBUTION OF PLANKTON

LAKES

GROUP I

Lake	Elevation Ft.	Temp. C.	Plankton	Relative Population	Date
Bear	9,600	10	DIATOMS		
			Asterionella gracillima	abundant	6/18
			Diatoma vulgare	few	
			Navicula sp.	few	
			Cymbella sp.	few	
			Synedra	scarce	
			DESMIDS		
			Closterium subcostatum	scarce	
			Staurastrum sp.	scarce	
			GREEN ALGAE		
			Cryptomonas ovalis	scarce	
			Volvox	scarce	
			PROTOZOA		
			Peridinium	scarce	
			COPEPODS		
			Cyclops	few	
		16	DIATOMS		7/15
			Asterionella gracillima	abundant	
			Diatoma vulgare	few	
			Navicula sp.	few	
			DESMIDS		
			Closterium sp.	few	
			GREEN ALGAE		
			Dinobryon sp.	abundant	
			Volvox	one colony	
			Cryptomonas ovalis	scarce	
			CLADOCERA		
			Daphnia pulex	abundant	
Nymph	9,800	17	DIATOMS		6/30
			Navicula sp.		
			Diatoma vulgare	abundant	
			DESMIDS		
			Penium closterioides	few	
			Micrasterias radiosa	few	
			Staurastrum sp.	few	
			COPEPODS		
			Cyclops	few	
			ROTIFERS		
			Anuraea	abundant	
Dream	10,000	7	DIATOMS		6/30
			Asterionella	abundant	
			Diatoma vulgare	few	
			Synedra	few	
			GREEN ALGAE		
			Cryptomonas erosa	scarce	
		8	DIATOMS		7/8
			Asterionella	abundant	
			Diatoma vulgare	few	
			DESMIDS		
			Microsterias radiosa	few	
			COPEPODS		
			Cyclops	scarce	
			ROTIFERS		
			Anuraea	scarce	

DISTRIBUTION OF PLANKTON—(*Continued*)

LAKES

Lake	Elevation Ft.	Temp. C.	Plankton	Relative Population	Date
GROUP I—Continued					
Emerald	10,200	8	DIATOMS		7/8
			Asterionella	abundant	
			Diatoma vulgare	few	
			DESMIDS		
			Micrasterias radiosa	few	
			GREEN ALGAE		
			Cryptomonas erosa	scarce	
GROUP II					
The Loch	10,700	8	DIATOMS		7/11
			Diatoma vulgare	few	
			GREEN ALGAE		
			Volvox	abundant	
			Cryptomonas erosa	few	
			COPEPODS		
			Cyclops	few	
Lake-of-Glass	10,800	6	DIATOMS		7/11
			Asterionella	abundant	
			GREEN ALGAE		
			Volvox	abundant	
			Cryptomonas erosa	few	
			COPEPODS		
			Cyclops	few	
			ROTIFERS		
			Noteus	few	
Sky-Pond	11,100	6	DIATOMS		7/11
			Asterionella	few	
			GREEN ALGAE		
			Volvox	abundant	
			Cryptomonas erosa	few	
GROUP III					
Mills	11,500	9	DIATOMS		7/18
			Navicula	few	
			DESMID		
			Cosmarium	few	
			ROTIFERS		
			Anuraea	few	
Jewel	11,600	9	DIATOMS		7/18
			Navicula sp.		
			Diatoma vulgare		
GROUP IV					
Fern	9,500	7	DIATOMS		6/25
			Navicula sp.	abundant	
			Diatoma vulgare	many	
			Synedra	few	
			GREEN ALGAE		
			Cryptomonas erosa	few	
Odessa	10,000	5	DIATOMS		6/25
			Navicula sp.	few	
			ROTIFERS		
			Anuraea	few	
GROUP V (Miscellaneous)					
Bierstadt	9,500	13	DIATOMS		6/19
			Diatoma vulgare	many	
			Navicula		
			DESMIDS		
			Cosmarium constrictum	few	
			Closterium subcostatum	few	
			GREEN ALGAE		
			Euglena viridis	few	
			Phacus pyrum	very few	
			PROTOZOA		
			Vorticella	very few	

DISTRIBUTION OF PLANKTON—(*Continued*)

LAKES

GROUP V—Continued

Lake	Elevation Ft.	Temp. C.	Plankton	Relative Population	Date
Cub	8,600	17	DIATOMS		6/21
			Diatoma vulgare	few	
			CLADOCERA		
			Daphnia pulex	very abundant	
			ROTIFERS		
			Anuraea	abundant	
Chipmunk	9,900	17	DIATOMS		6/23
			Diatoma vulgare	few	
			Navicula sp	few	
			DESMIDS		
			Euastrum abruptum	few	
			Cosmarium constrictum	few	
			Closterium subcostatum	few	
			CLADOCERA		
			Daphnia pulex	few	
			ROTIFERS		
			Anuraea	abundant	
			Polyarthra	few	
Lily	9,900	18	DIATOMS		6/24
			Navicula	abundant	
			DESMIDS		
			Micrasterias radiosa	few	
			GREEN ALGAE		
			Chlamydomonas sp	few	
			Volvox	few	
			Euglena sp	very few	
			PROTOZOA		
			Ceratium	very few	
			CLADOCERA		
			Daphnia pulex	many	
			COPEPODS		
			Cyclops	few	
			ROTIFERS		
			Anuraea	few	
			Noteus	few	
Haiyaha	10,700	6	DIATOMS		7/8
			Asterionella	few	
			Diatoma vulgare	few	
			GREEN ALGAE		
			Cryptomonas ovata	very few	
			ROTIFERS		
			Anuraea		
			Noteus		
			COPEPODS		
			Cyclops	few	

STREAMS

Streams	Location	Temp. C.	Plankton	Relative Population	Date
Big Thompson	Below "Pool"	6	DIATOMS		6/18
			Navicula	many	
			Synedra acus		
			DESMIDS		
			Closterium subcostatum		
		8	DIATOMS		7/10
			Navicula	many	
			Nitzschia	few	
		9	DIATOMS		7/20
			Navicula	few	

DISTRIBUTION OF PLANKTON—(*Continued*)

STREAMS

Stream	Location	Temp. C.	Plankton	Relative Population	Date
	Stead's Hotel	8	DIATOMS		7/3
			Navicula sp.	few	
			Diatoma vulgare	few	
			DESMIDS		
			Closterium sp.	few	
			ROTIFERS		
			Anuraea		
		8	DIATOMS		7/10
			Navicula	few	
		11	*Navicula*	few	7/20
	Moraine Park	8	DIATOMS		6/27
			Navicula	few	
			Diatoma vulgare	few	
			DESMIDS		
			Cosmarium constrictum	few	
			Closterium subcostatium		
			PROTOZOA		
			Loxodes		
		8	DIATOMS		7/10
			Navicula sp.	few	
			Diatoma vulgare	few	
			Closterium subcostatium	few	
			Cosmarium constrictum	few	
		11	DIATOMS		7/20
			Diatoma vulgare	few	
			Navicula sp.		
			DESMIDS		
			Cosmarium constrictum		
			Closterium subcostatum		
Glacier Creek	Below Bear Lake	8	DIATOMS		7/2
			Asterionella	many	
			Navicula	many	
			Nitzschia	few	
			Synedra	few	
			GREEN ALGAE		
			Cryptomonas erosa	very few	
	Sprague's Lodge	8	DIATOMS		7/2
			Asterionella	many	
			Navicula	few	
			Nitzschia	few	
			Diatoma vulgare	few	
			DESMIDS		
			Closterium	few	
	Mouth of Mill Creek	8	DIATOMS		7/2
			Asterionella	few	
			Navicula	few	
			Nitzschia	few	
			GREEN ALGAE		
			Cryptomonas erosa	very few	
		10	DIATOMS		7/15
			Asterionella	few	
			Navicula	few	
			DESMIDS		
			Micrasterias radiosa	few	
Fall River	Chasm Falls	5	DIATOMS		7/9
			Navicula	very few	
		8	DIATOMS		7/16
			Navicula	few	
	End-of-Valley Camp	8	DIATOMS		7/9
			Navicula sp.	few	
			Diatoma vulgare	few	
		9	DIATOMS		7/16
			Navicula sp.	few	

DISTRIBUTION OF PLANKTON—(*Continued*)

STREAMS

Stream	Location	Temp. C.	Plankton	Relative Population	Date
	Fall River Lodge	5	DIATOMS		7/6
			Navicula sp.	few	
			Diatoma vulgare	few	
			ROTIFERS		
			Noteus	very few	
			PROTOZOA		
			Actinosphaerium sol	very few	
		8	DIATOMS		7/9
			Navicula sp.	few	
			Diatoma vulgare	few	
			DESMIDS		
			Closterium sp.	few	
			PROTOZOA		
			Cyclidium		
	Highway Bridge U. S. 34	7	DIATOMS		6/28
			Navicula	few	
			Diatoma vulgare	few	
		8	DIATOMS		7/9
			Navicula sp.	very few	
			PROTOZOA		
			Cyclidium	very few	
	Below Sheep Lake	7	DIATOMS		6/28
			Navicula	few	
			GREEN ALGAE		
			Tetraspora	few	
	Above Estes Park		DIATOMS		6/28
			Navicula	few	
			Diatoma vulgare	few	
			DESMIDS		
			Cosmarium rostratum	few	

DISCUSSION AND SUMMARY

A study of the data presented shows that the diatoms were the most abundant group of planktons in both the lakes and streams, followed in numbers by the desmids and an occasional green flagellate and protozoan. In some lakes Daphnia, Cyclops and rotifers were abundant. The small number of species may in a large part be due to the low temperature, in most cases below 10 degrees Centigrade. The species found in the Park as listed in this paper are the typical cold water forms that occur in the Ohio Basin (Brinley and Katzin 1942). The total plankton volume in the mountain streams is much lower than the volume of the same species in the Ohio River Basin under similar temperature conditions, which I believe can be attributed to the fertilizing action of the organic pollutants in the Ohio stream.

A comparative study of the streams and lakes in the Park showed no specific differences in the plankton algae, however, the population density of individual species were generally higher in the lakes. Daphnia and Cyclops were abundant in Bear, Cub and Lily lakes. Rotifers were numerous in Chipmunk, Cub, and Lily lakes. Hellgrammites and leeches were abundant in the latter lakes and these lakes also supported a heavy population of water lilies.

A careful study of the distribution records indicates a possible similarity in the plankton algae in closely related lakes. The lakes in group one, Bear, Nymph, Dream and Emerald are all located in the Tyndall Glacier Gorge. The characteristic specie of algae found in three of these lakes is the diatom, *Asterionella*. It is also interesting to note that this diatom was widely distributed in Glacier Creek which receives the outlet from Bear Lake and Glacier Gorge. The individual specimens of this fragile diatom in Glacier Creek were always broken which indi-

cates that the origin of this specie was in the lakes and not a direct product of the stream. A few *Asterionella* were, however, found in Lake Haiyaha, Lake-of-Glass, Sky Pond, and The Loch. Volvox was found abundantly in the Loch Vale Lakes (group 2); The Loch, Lake-of-Glass and Sky Pond, and only occasionally elsewhere.

The stream plankton was typically diatoms. There is a tendency for the desmids to increase in the Big Thompson River as it flows through the meadows in Moraine Park.

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The New Gray's Manual of Botany

It has been forty-two years since Gray's Manual appeared in a new edition. In that period most of us have become so familiar with the Seventh Edition of 926 pages that in some of our homes it has occupied a place comparable to that of the Bible, the dictionary or the telephone directory. The 8th Edition with its 1632 pages is, of course, a much larger book. The addition of 706 new pages, in spite of the extra thin quality of the paper, naturally increases its bulk.

The extra pages represent the work of specialists who have revised many genera with the addition of new species. In recent years intense study of collections made in eastern Quebec and Newfoundland have brought to light many isolated or relect species while studies now being carried on in Virginia, Missouri, and Minnesota show that three or four times as many new species which should be included in future editions, than the inclusion of theCanadian species has totaled in the 8th Edition.

When Asa Gray issued his first Edition in 1848 he had the assistance of three well known botanists of that period, Carey, Oakes and Olney, in the preparation of the Eighth Edition. Dr. Fernold had contributions from 400 "enthusiastic cooperators," as he calls them. Two illustrations will indicate the change in size. In the Seventh Edition the genus *Rubus* contains 38 species and in the Eighth it is expanded to 205 species. This has necessitated the use of 45 pages as over against the 6 pages in the earlier edition. Similarly in the treatment of the genus *Crataegus*. The number of species is increased from 65 to 103 and this has added 33 new pages. To lesser extent the increase in size of the current edition is also due to the fuller list of localities in which plants occur and also a wider offering of English names. The editor was advised by the Latin professor at Harvard, Dr. Pease, to translate all Latin names, even such common ones as *alba* or *albiflora*, since "nowadays no understanding of the simplest Latin words can be assumed."

With regard to the keys in the new edition, considerable change has been made. The dichotomous keys with the use of the small letters, often pages apart, are not nearly so convenient as the keys in the Seventh Edition. In the latter the major division of the keys are indicated in heavy black-faced type which makes the alternative alphabetical letter easier found by the beginner and elementary student. In such families as the Cruciferae and the Compositae the omission of the Artificial Keys is a great loss to the beginning student and the small "Key to the Subfamilies and Tribes" (p. 1358) is scarcely adequate for sophomores beginning systematic study of the Composites.

On the whole the new edition of Gray's Manual is a notable achievement in this field of botany and brings into the purview of the systematists in the schools and colleges, the additions and revisions that specialists have been working upon during recent years. But the new edition rather removes the Manual from the class of a ready household companion and text-book for beginners, to the sphere of a reference work. A position comparable to the library status occupied by the 3 volume illustrated set of Britton and Brown's Flora. The enlarged format militates against its use by field classes. The fact remains that the new edition is a splendid work for the serious student or collector with some knowledge of systematic botany.—*H. H. M. Bowman.*

Gray's Manual of Botany, 8th Edition, illustrated, July, 1950. A Handbook of the Flowering Plants and Ferns of the Central and Northeastern United States and Adjacent Canada. Edited by Merritt L. Fernald, Harvard University. American Book Company, $9.50.